CONTRIBUTIONS TO E-MENTAL HEALTH TREATMENT APPROACHES FOR DEPRESSION IN ADULTHOOD AND OLD AGE

Thesis

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Abstract

The overall focus of this doctoral thesis was to investigate new psychotherapeutic approaches for the treatment of depression, which is one of the most frequent mental disorders. It is known from epidemiological research that treatment rates in this context are low. Moreover, the symptomatology of depression changes with age, moving towards milder forms in old age. Hence, the development or adaptation of certain interventions is highly relevant. The two studies that are reported in papers 2 and 3 of this cumulative thesis focused on two specific psychotherapeutic methods: life-review intervention and cognitive behavioural therapy. Furthermore, these methods were investigated including different age groups (adults and older adults) in specific settings, so-called internet-supported therapeutic interventions. One study (presented in paper 2) investigated the working alliance in a randomized controlled trial with an online intervention group vs. a face-to-face control group for a cognitive behavioural treatment of depression (including adults). The results showed that the working alliance was comparable in these two groups, but did not function as predictor with regard to outcome (N = 53). The second study (presented in paper 3) investigated a life-review intervention for depressive older adults (65 or over) in a randomized controlled trial (intervention vs. waiting list control group). The life-review intervention was conducted in a face-to-face setting with additional use of two modules of the e-mental health Butler system. The results indicated positive effects of the intervention on depressive symptoms, well-being, self-esteem and obsessive reminiscence, but not on life-satisfaction and integrative reminiscence (N = 36). Since the use of new media in psychotherapeutic settings (e-mental health) for older adults is

rather new, we conducted a review in this context (paper 1), highlighting that research in this field is promising but of inconsistent quality. As highlighted in the synopsis, internet-supported therapeutic interventions in general and life-review intervention in particular are promising settings and approaches for the treatment of mental disorders, particularly depression, but show certain limitations and potential for future research.

Zusammenfassung

Aus epidemiologischen Studien ist bekannt, dass die Depression zu den häufigsten psychischen Erkrankungen zählt, gleichzeitig aber die Behandlungsraten niedrig sind. Weiter zeigen sich Besonderheiten der Symptomatik bei älteren Stichproben, hin zu einer subsyndromalen oder leichteren Form. Diesen Erkenntnissen zu Grunde liegend, befasste sich die vorliegende Arbeit mit der Untersuchung neuer psychotherapeutischer Ansätze zur Depressionsbehandlung im Erwachsenen- und höheren Lebensalter. In zwei Studien, die in Artikel 2 und 3 dargestellt werden, kamen zwei psychotherapeutische Verfahren zur Anwendung: Lebensrückblicksintervention und kognitive Verhaltenstherapie, die in einem Internet-gestützten Setting eingesetzt wurden. Eine Studie, die in Artikel 2 dargestellt wird, hatte zum Ziel die therapeutische Allianz in einer randomisierten Kontrollgruppenstudie (online vs. face-to-face Interventionsgruppe) zur Behandlung von Depression im Erwachsenenalter (kognitive Verhaltenstherapie mit ergänzendem Lebensrückblicksmodul) zu untersuchen. Es zeigten sich keine signifikanten Unterschiede hinsichtlich der therapeutischen Allianz zwischen den beiden Gruppen, was darauf schliessen lässt, dass diese ebenso gut in einem online Setting hergestellt werden kann (N = 53). Allerdings konnte die therapeutische Allianz nicht als Prädiktor für Depression identifiziert werden. In der zweiten Studie, die in Artikel 3 dargestellt ist, wurde ebenfalls in einem randomisierten Kontrollgruppendesign (Interventions- vs. Wartelistenkontrollgruppe) eine Lebensrückblicksintervention für depressive ältere Menschen ab 65 Jahren untersucht. Die Intervention fand in einem face-to-face Setting mit ergänzendem Einsatz zweier Module des e-mental health Computersystems

„Butler“ statt. Es zeigten sich positive Effekte der Intervention auf die Depression, weiter auf Wohlbefinden, Selbstwertgefühl und obsessive Reminiszenz, aber nicht auf die Lebenszufriedenheit und die integrative Reminiszenz (*N* = 36). In einem weiteren Artikel (Artikel 1) ist ein Review über Literatur zum Einsatz neuer Medien in psychotherapeutischen Settings und zu gesundheitsfördernden Massnahmen (e-mental health) im Alter dargestellt. Es zeigte sich, dass dies ein relativ neues Forschungsgebiet ist, mit vielversprechenden Ergebnissen der eingeschlossenen Studien, aber auch mit qualitativen Kritikpunkten. Ein Überblick und Ausblick zum Thema der Dissertation wird in einer anfänglichen Synopse dargestellt. Abschliessend lässt sich sagen, dass Internet-gestützte therapeutische Interventionen generell und Lebensrückblicksintervention im speziellen vielversprechende Settings und Methoden zur Depressionsbehandlung sind, aber auch eine Reihe von Kritikpunkten und daraus folgenden Implikationen für weitere Forschung aufweisen, die am Ende der Synopse diskutiert werden.

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Included papers

Preschl, B., Wagner, B., Forstmeier, S. & Maercker, A. (2011). E-health interventions for depression, anxiety disorders, dementia, and other disorders in older adults: a review. *Journal of CyberTherapy & Rehabilitation*, *4*(3), 371-385.

Preschl, B., Maercker, A., & Wagner, B. (2011). The working alliance in a randomized controlled trial comparing online with face-to-face cognitive-behavioral therapy for depression. *BMC Psychiatry, 11*(1), 189.

Preschl, B., Maercker, A., Wagner, B., Forstmeier, S., C, Baños, R., Alcañiz, M., Castilla, D. & Botella, C. Life-review intervention with computer supplements for depression in the elderly: A randomized controlled trial. *Manuscript submitted for publication.*

List of tables and figures

Paper 1:

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Overall introduction and aims

Overall focus of the Doctoral thesis

The focus of this doctoral thesis was to investigate specific psychotherapeutic methods (life-review intervention and cognitive behavioural therapy) for specific age groups (adults, young-olds and old-olds) in different settings (online and face to face with computer supplements) for the treatment of depression.

In this context, two studies were conducted at the University of Zurich: The first investigated an online vs. face-to-face cognitive-behavioural therapy for depression in a randomized controlled trial. The second paper of this cumulative thesis focuses on the working alliance in this context.

A further study investigated a life-review intervention with computer supplements for depression in the elderly in a randomized controlled trial. In this context, the third paper of this thesis reports results for depression and other variables. Since the use of new media in psychotherapeutic settings (e-mental health) in older age groups is rather new, we conducted a review in this context (see first paper: E-Health Interventions for Depression, Anxiety Disorder, Dementia, and Other Disorders in Old Age: A Review).

While the research papers focused on detailed study designs, procedure and outcomes, this synopsis aims to provide background information showing why we focused on the aforementioned areas. Moreover, the overall findings are discussed in order to provide an outlook for future research in these research fields.

Epidemiology of depression in adulthood and old age and relation to treatment

As described above, this thesis focused on investigating new e-mental health treatment approaches for depression in adulthood and old age. As known from epidemiological findings, unipolar depression is among the most frequent mental disorders, and like other mental disorders, is associated with low treatment rates (Wittchen et al., 2011). The authors cite “under-utilization, under-recognition, under-treatment and lack of resources” (p. 657) as reasons for these low treatment rates. Nevertheless, depression and other mental disorders bring about high healthcare costs. Therefore, the development of new psychotherapeutic treatment methods or the adaptation of existing ones is highly relevant in order to reach a wide range of patients, meet their individual needs, and provide accessible and cost-effective treatment.

Additionally, it is worth considering that the symptomatology of depression changes with age (Cole & Dendukuri, 2003; Wernicke, Linden, Gilberg, & Helmchen, 2000). Compared to younger adults, older adults show higher prevalence rates for milder forms or subthreshold depression than for major depressive disorder, while subthreshold depression is considered as a risk factor for developing a major depressive disorder (Beekman et al., 2002). Therefore, it is crucial that treatment meets the needs of certain age groups, i.e. in the case of depression focuses further on subthreshold and milder forms – also to prevent the development of a major depressive disorder.

Indication of technology use in therapeutic settings and terminology

Internet-supported therapeutic interventions have been under investigation for over 15 years, and the number of randomized controlled studies is growing (Barak, Hen, Boniel-Nissim, & Shapira, 2008). In a meta-analysis, the authors report a medium effect size (0.53) in this context, which is comparable to face-to-face psychotherapy. A total of 92 studies involving 9,764 clients were included in this meta-analysis. The following paragraph focuses on the indications and possible contra-indications of internet-supported therapeutic interventions and the terminology used in this context, since the latter remains inconsistent.

Online therapy, web-based therapy, e-therapy are only a few of the terms used in the field. Recently, Barak, Klein, and Proudfoot (2009) suggested a conceptualization of online facilities, i.e. internet-supported therapeutic interventions. The authors distinguish between:

(1) *"Web-based interventions* (i.e. web-based education interventions, self-guided web-based therapeutic interventions, and human-supported web-based therapeutic interventions", p.2),

(2) *"Online counselling and therapy* (i.e. individual or group online contact with a health professional, using either synchronous or asynchronous communication modes", p.6),

(3) *"Internet-operated therapeutic software* (e.g. virtual-reality clinical applications as effective treatment applications, e.g. for exposure therapy", p.8), and

(4) *"Other online activities* (e.g. e-mail, web-blogs, chat or other applications as supplements to a face-to-face therapy", p.9).

For the current thesis, the latter three terms are most relevant. Paper 2 described one part (working alliance) of a study on a cognitive behavioural therapy for depression that was conducted in an online setting compared to a face-to-face setting. The therapy was provided online via individual e-mail contact with a professional (psychotherapist); a so-called online therapy. In the study described in paper 3, a life-review intervention was investigated using computer supplements in a traditional face-to-face setting; a so-called internet-operated therapeutic software. In the final part of the face-to-face session (approximately one third of the whole session), the patient and therapist used certain depression computer modules of an e-mental health system, the so-called Butler System (Botella et al., 2009).

In the context of internet-supported interventions, certain advantages (indications) and disadvantages (possible contra-indications) are discussed. Griffiths and Cooper (2003) describe online therapy as a convenient and cost-effective treatment form. Help-seeking individuals can easily obtain access to online therapy, regardless of place and time. Since therapists do not need a room or have travelling times, they can offer online therapy at a lower cost than face-to-face therapy. Griffiths and Cooper (2003) further define 5 types of groups who may face barriers to accessing face-to-face therapy (p. 122): “individuals

(1) who are *physically disabled*,

(2) who are *agoraphobic*,

(3) who are *geographically isolated* and/or have no access to face-to-face therapy,

(4) who are *linguistically isolated*, and

(5) *who feel less stigmatized or afraid* of contacting someone online than face to face".

A lack of face-to-face contact could also be added to the list of disadvantages (Griffiths & Cooper, 2003). In an online setting, the therapist is not able to observe a person`s behaviour or body language and is also unable to include this information in the diagnostic process. Not physically seeing the patient could lead to misunderstandings and misinterpretations in various ways. Concerning the diagnosis, Andersson and Cuijpers (2008) note that it is common in online treatments (or research) to diagnose patients based on information from self-report. The authors highlight the importance of a proper diagnosis made by clinicians. In online settings, a diagnosis session could be conducted on the telephone. Another known problem of online therapy research and practice are drop-outs. Due to anonymity issues, patients face fewer barriers to ending the treatment. Moreover, it is more demanding for therapists to contact them after dropping out. Andersson, Carlbring, Berger, Almlov, and Cuijpers (2009) suggest a time-limited format, discussing a *clear deadline* with the patient in order to guarantee compliance. Griffiths and Cooper (2003) add severity of symptoms to the list of disadvantages. Online therapy is not recognized as indicated for individuals with high symptom severity, suicidal tendency, and others. Additionally, Internet security and technical demands should be considered. Instead of using conventional e-mail systems, the communication should occur via a secure contact system (Andersson et al., 2009; Griffiths & Cooper, 2003). Platforms are further recommended to be easy to use and user-friendly. In general, some psychological associations provide guidelines including

security, ethical issues and laws and regulations as well as training of online therapists (for Switzerland, see FSP: www.psychologie.ch).

As also highlighted in paper 1, usability concerns of certain web-pages/platforms are crucial when considering older adults, who may not be as familiar with technology as younger adults. A necessary precondition for the use of any technical device in old age is that the technology meets the needs of older adults and is accepted by this target group. Charness and Boot (2009) discuss research on attitudes toward technology in old age, as well as age-related changes in the perceptual, cognitive, and motor abilities that influence successful technology use. The authors conclude that age-related differences in technology use may decline over time, but will not disappear in future generations. Web designers of internet-supported interventions should therefore take certain usability guidelines into account. In general, the development of technology used in the two studies reported in this thesis followed the above-reported guidelines.

Cognitive Behavioural Therapy and Life-Review Intervention as suitable therapeutic formats for internet-supported therapeutic interventions

The treatment manual used in the study presented in paper 2 was based on a German CBT treatment manual for depression (Hautzinger, 2003), with an added life-review intervention module (Maercker, 2009). Life-review intervention (LRI) (with CBT background) was also the main therapeutic approach in the study presented in paper 3. To illustrate the therapeutic framework of CBT and LRI, the following paragraphs provide a general description and definition of CBT and LRI – both in face-to-face and internet-supported settings. Since the study presented in paper 3 constituted

the main practical research part of this doctoral thesis, the following paragraphs will focus in more detail on LRI and autobiographical narration in general.

(Online and face-to-face) Cognitive Behavioral Therapy (CBT)

Research on online therapy basically addresses structured and time-limited approaches, mostly CBT (Andersson & Cuijpers, 2009; Barak, Hen, Boniel-Nissim, & Shapira, 2008). CBT delivered online (online CBT) was found to be a highly effective therapeutic approach (effect size: 0.83, including 51 studies, involving 3960 participants, meta-analysis: (Barak et al., 2008). Similarly, research on CBT for depression identified this treatment approach as effective for depression in face-to-face psychotherapy (Butler, Chapman, Forman, & Beck, 2006) and further in online therapy (Andersson & Cuijpers, 2009). A major criticism of online CBT was the belief that a strong therapeutic (or working) alliance comparable to a face-to-face setting could not be established in an online setting. Research showed that this was not the case. Numerous randomized controlled studies report comparable data on working alliance in face-to-face and online settings (e.g. Knaevelsrud & Maercker, 2007). The randomized controlled trial reported in paper 2 of this thesis focused on depression in this context. To our knowledge, this study was the first randomized controlled trial for depression to compare the therapeutic alliance between patient and therapist in an online vs. face-to-face setting. In both settings, patients received the aforementioned treatment manual for depression (Hautzinger, 2003), with an added life-review intervention module (Maercker, 2009). The following paragraph describes the

main focuses of CBT in general in order to provide background information on the CBT approach used in this study.

Dobson (2010) highlights three basic assumptions of various existing CBT approaches (p. 4):

(1) *"Cognitive activity affects behaviour*,

(2) *Cognitive activity may be monitored or altered*, and

(3) *Desired behaviour change may be brought about through cognitive change*. "

In addition, emotional and physical aspects are added to the model, i.e. "*cognitive mediation affects behavioural, emotional and physiological processes*" (p.6). In CBT, three main methods are practiced: focus on coping skills, on problem solving, and on cognitive restructuring (Dobson, 2010). In general, CBT is time-limited, problem-focused and recognizes the client (patient) as active individual who is encouraged in therapy to change his thoughts and actions. Moreover, CBT is also an evidence-based therapeutic approach (Dobson, 2010). Like other therapeutic approaches, CBT includes a variety of different approaches, e.g. Rational Emotive Behaviour Therapy (Albert Ellis), Cognitive Therapy (Aaron Beck), Self-Instructional Training (Donald Meichenbaum), Schema Therapy (Jeffrey Young), mindfulness-based Interventions (Jon Kabat-Zinn) and others.

In the study described in paper 2 the main focus was on the cognitive theory of depression by Beck and colleagues (german: Hautzinger, Keller, & Kühner, 2006). The program involved the following modules: introduction (psychoeducation), behavioural analysis, planning of activities, daily structure, cognitive restructuring, promotion of social competence, and relapse prevention. The added life-review module (Maercker, 2009) was

essentially used to activate individual resources (e.g., to identify coping strategies that had helped participants to cope with unresolved past experiences or depressive episodes).

The following paragraph provides further insight into life-review intervention (LRI) and related approaches in general.

Life-review (and related) approaches (as computer supplement and in face-to-face settings)

As mentioned above, the main therapeutic approach in the study presented in paper 3 was life-review intervention (LRI) (with CBT background). The intervention was conducted in a traditional face-to-face setting and further contained a computer intervention part, comprising two 'depression modules' of an e-mental health computer program, the so-called "Butler" system (Botella et al., 2009), which is described in papers 1 and 3. The first module contains "Virtual Environments" (VE), in which the user learns techniques to reduce negative mood and to imagine, recall and describe positive autobiographical memories. The second module, a 3D adaptation of a book containing several chapters, is called the "Book of Life". Here, as in the other module, the patient is encouraged to imagine and describe in detail positive auto-biographical events (e.g. a very happy moment when he or she was a child). By incorporating text, pictures, and Mp3 music files, the "Book of Life" can be customized by the user. In the face-to-face life-review part, the focus was on positive and negative past events, while the computer part focused exclusively on the imagination of positive autobiographical experiences (see also paper 3).

Generally speaking, traditional imagination techniques have been widely used in face-to-face psychotherapy in the last decades (psychoanalytic, systemic, humanistic and cognitive-behavioural therapy, (Vincelli, 1999). With regard to depression, Aaron Beck described very early on the relevance of inducing positive images in order to overcome or restructure depressive and pessimistic views of one's life and future (cognitive restructuring), a phenomenon that has a special focus on the past life that is most relevant in life-review intervention. Computer-generated environments (e.g. virtual environments) provide a more realistic and vivid way of inducing positive mood compared to traditional imagination techniques, addressing a wider range of the sensory motor spectrum (Vincelli, 1999).

Recently, certain computer tools have been developed focusing on autobiographical narration in a therapeutic context. Steen, Brinkman, Vermetten, and Neerincx (2010) for instance, developed a multimedia application for treating patients suffering from Post-Traumatic Stress Disorder (PTSD), providing a platform for the patient and therapist to attend to past events and memories using individual information, e.g. photographs. Moreover, the patient is encouraged to construct an individual 3D environment that should support him or her to restructure stressful past events. In addition, the work of Smith, Crete-Nishihata, Damianakis, Baecker, and Marziali (2009) provides an example of the creation of a multimedia tool for individuals suffering from cognitive impairment, which gives the possibility to create individual biographies and interact with family caregivers. The use of this tool showed promising results with individuals suffering from Mild Cognitive Impairment or Alzheimer's disease. In general, e-mental health interventions targeting older adults have been recognized as a promising

approach for a variety of domains, including depression (as reviewed in paper 1).

To our knowledge, the study reported in paper 3 was the first randomized controlled trial with a focus on depression in this context, investigating a life-review intervention in a combined e-mental health setting (face-to-face with computer supplements). The main objective of this study was to investigate whether this intervention led to a reduction in depressive symptoms. The effect size in the study presented in paper 3 was medium (0.72), and therefore comparable to what was found for face-to-face-only LRI. In a meta-analysis in this context, Bohlmeijer, Smit, and Cuijpers (2003) reported a large effect size (0.84). Recently, Pinquart and Forstmeier (in press) reported an overall medium effect size (0.57) at post-treatment for depression.

Compared to other forms of reminiscence, life-review intervention has been defined as a structured, time-limited and evaluative intervention focusing on the whole life-span (Haight & Haight, 2007; Pinquart & Forstmeier, 2012). Through structured questions, life-review intervention enables the individual to focus equally on positive and negative past events, with the aim of obtaining a coherent and balanced view of one's past life. Life-review intervention focuses on (Maercker, 2002):

(1) the *balance of positive and negative reminiscence*,

(2) the *redefinition of negative experiences*, and

(3) the *elaboration of memory*.

Recent publications name basically three forms of interventions related to reminiscence (Pinquart & Forstmeier, 2012; Westerhof, Bohlmeijer, & Webster, 2010):

(1) *life-review therapy* (also called life-review intervention),

(2) *life-review*, and

(3) *simple reminiscence*.

Compared to simple reminiscence, life-review and life-review intervention (or therapy) represent structured ways of reviewing one`s past, while the latter addresses serious mentally ill individuals and is conducted in a therapeutic setting. Both life-review and life-review interventions follow a certain structure addressing the whole life-span, whereas reminiscence is also conducted in unstructured formats. In general terms, the process of re-thinking and narrating auto-biographical events (positive and negative) is natural, and does not only refer to therapeutic settings. Non-therapeutic forms of reminiscing are described below. The study described in paper 3 followed a structured life-review intervention procedure based on cognitive-behavioural principles. Autobiographical narration is further relevant with different foci in other therapeutic approaches, e.g. psychodynamic psychotherapy.

Autobiographical narration and further psychotherapeutic approaches

A psychodynamic life-review therapy approach was recently described by Kast (2010) and showed similarities to and differences from the above-described structured life-review intervention. This therapeutic approach is described as unstructured, not necessarily addressing all stages of the human life-span. The individual narrative is related to psychodynamic complexes, i.e. conflicts in relationships that are highly emotional (following C.G. Jung, p. 162). The author basically focuses on guilt complexes in this context.

A psychodynamic narrative analysis for single case studies (JAKOB narrative analysis) is described by Boothe, Grimm, Hermann, and Luder (2010). The JAKOB analysis focuses on "*narrative dynamics* and *conflict dynamics"* (p.511f). First, the transcripts of the sessions are analysed focusing on the lexical structure, and the narrative is then related to psychodynamic conflicts (wish vs. anxiety). In reference to dramaturgy, the narrative follows a logical structure: "*a beginning (starting situation), a middle (the complication), and an end (result)"* (p. 513). The "story plays" in the therapeutic situation, with the therapist as listener, but also actively attending.

Besides reminiscence and life-review (intervention), Maercker (2012) identifies three other therapeutic approaches that deal with autobiographical narration:

(1) *testimony therapy*,

(2) *narrative exposure therapy, and*

(3) *biography work*

Testimony therapy involves political refugees who have experienced politically driven traumata. The therapeutic approach focuses on reframing these traumata through testimony (e.g. video or audio records) (Agger & Jensen, 1990). Recently, Knaevelsrud, Böttche, and Kuwert (2009, 2010) presented a so-called Integrative Testimonial Therapy approach provided in an online setting (a standardized, internet-based writing therapy, see www.lebenstagebuch.de). This study was further included in the review in paper 1.

The second therapeutic approach that is described by Maercker (2012) is narrative exposure therapy (NET), which has its roots in cognitive behavioural therapy and testimony therapy (Neuner, Schauer, Klaschik,

Karunakara, & Elbert, 2004). Through narration, the patient is exposed to experienced traumatic situations with a view to structuring and ordering these events.

Furthermore, Maercker (2012) added biography work to therapeutic forms of biographical narration (also to a social therapy approach) on the one hand, and (other forms of biography work) to non-therapeutic forms on the other. The former is used, for instance, in the treatment of individuals who suffer from mild cognitive impairment or Alzheimer's disease, with the aim of re-constructing the autobiographical life story and fostering memories, communication and active behaviour.

Autobiographical narration in non-therapeutic forms

As outlined above, autobiographical narration is the subject of different therapeutic approaches with different foci. Moreover, it also occurs in a non-therapeutic manner. Recently, Maercker (2012) described the following non-therapeutic aspects of auto-biographical narration:

(1) *autobiographies*,

(2) *oral history interviews*, and

(3) non-therapeutic forms of *biography work* (e.g. with children and adolescents)

Autobiographies are known as autobiographical publications (usually in book formats) of one`s own life story, e.g. from celebrities, politicians, or literary figures. In contrast to diaries, which are also used in therapeutic formats, neither autobiographies nor so-called oral history interviews are part of a therapeutic procedure (Maercker, 2012). The latter are documented interviews with historical witnesses and are used in historical work

(Thompson, 2000), which further integrate other materials such as photographs, historical documents etc. Besides the aforementioned therapeutic purpose, biography work is also conducted in pedagogic work for preventive and developmental reasons, for instance in school classes (Morgenstern, 2011). Non-therapist-guided biographies are also common in old age, even in online settings. An example of such a website is *www.lifebio.com*, a platform for creating and writing one`s life story (Troy, 2006) with the possibility to share it with significant others. The platform provides guided questions that invite the user to reflect on past autobiographical events.

In the following, the findings of the doctoral thesis studies will be presented. Returning to this discourse on broader aspects of therapeutic approaches in the field, in paper 3, we focused on life-review intervention as defined above, and in paper 2, on cognitive behavioural therapy following Beck with an added life-review module.

Findings of the Doctoral Thesis Studies

Paper 1

Background

As discussed in paper 1, there has been a growing research interest concerning e-health interventions including older adults in the last years. A variety of projects has focused on a wide range of domains. Paper 1 provides a review of e-health interventions in old age, focusing among other things on some of the most prevalent mental disorders (Wittchen et al., 2011) of this age group: depression, anxiety disorder, and dementia. One point of interest is whether these interventions are effective regarding symptom reduction or (in the case of preventive or supportive programs such as ambient assisted living approaches or training programs) in fact show the suggested advantages. Furthermore, this review focused on whether the proposed technology met the needs of older adults and was accepted by this target group in order to guarantee benefit from health services provided through these media.

Method

First, we searched in common psychological databases (*MEDLINE, Premedline, PsycCritiques, PsycINFO, PSYNDEXplus, PubMed/Medline, Web of Science*) for articles, abstracts, and conference proceedings published in German or English. Second, common Internet search machines (google and google scholar) were consulted, and third, reference lists and the archives of the journal Gerontechnology were screened including the

following terms: *e-health, e-mental health, Internet, online, technology, intervention, therapy, old age, older people, caregivers, significant others, family members, gerontechnology, depression, anxiety, dementia, mobility, ambient assisted living, monitoring,* and *healthy ageing*.

Results

Table 1 in paper 2 provides information on all of the included studies. Overall, the review involved a total of 965 participants aged 65 years and above. This review highlighted that certain programs were, in fact, developed with a focus on the needs of older adults, were accepted by the target group and showed the expected outcomes. Indeed, the review identified a lack of randomized controlled trials, and as previously reported (Broekens, Heerink, & Rosendal, 2009; Chan, Campo, Esteve, & Fourniols, 2009; Charness & Boot, 2009; Erren-Wolters, van Dijk, de Kort, IJzerman, & Jannink, 2007), robust research designs, which is underlined by frequent publications of pilot and short-term studies. To our knowledge, findings from only one completed RCT study on e-health and depression in old age (Spek et al., 2008; Spek et al., 2007) and three completed RCT studies on e-health and dementia in old age (Mahoney, Tarlow, & Jones, 2002; Marziali & Donahue, 2006; Schulz et al., 2003) have been published to date.

Brief discussion

To conclude, this review showed that results in the field indicate that e-health may, in the future, be able to make a significant contribution to active and healthy aging. Nevertheless, this research field is still at an early stage and the reported studies or pilot studies are of inconsistent quality. Moreover,

there is an ongoing development of certain prototypes that have, on the whole, been rarely implemented on the market. In addition, ethical and legal issues warrant particular consideration in this context (Chan et al., 2009; Charness & Boot, 2009). Beyond these challenges, we identified some high-quality research and a variety of innovative ongoing research and pilot studies in the field, indicating that these devices are highly useful for the target group.

Paper 2

Background

As also highlighted in this synopsis, numerous efficacy studies in recent years have found internet-supported therapeutic interventions for depression to be effective (Barak et al., 2008). Nevertheless, there has been scant consideration of therapeutic process factors in this context. The working (or therapeutic) alliance between therapist and patient is one of these process factors. Numerous empirical studies in conventional face-to-face treatment settings have shown an association of the working alliance with treatment outcome (Horvath & Symonds, 1991). However, little is yet known about the impact of the working alliance in internet-based interventions, particularly as compared with face-to-face therapy. Some studies focusing on PTSD (e.g. Knaevelsrud & Maercker, 2007) or other disorders showed no significant differences concerning the working alliance in an online compared to a face-to-face intervention group. To our

knowledge, no randomized controlled trial yet exists for depression in this context.

Method

In a randomized controlled trial (online vs. face-to-face intervention group), the study presented in paper 2 explored the working alliance between client and therapist in the middle and at the end of a cognitive-behavioural (CBT) intervention for depression. To maximize comparability, all patients received the same treatment manual over an 8-week timeframe. The treatment manual was based on a German CBT treatment manual for depression (Hautzinger, 2003) with an added life-review intervention module (Maercker, 2009). The participants completed the Beck Depression Inventory (BDI) post-treatment and the Working Alliance Inventory at mid- and post-treatment. In addition, the therapists completed the therapist version of the Working Alliance Inventory at post-treatment.

Results

25 individuals participated in the online intervention group and 28 individuals in the face-to-face group. 2 participants in the face-to-face group and 7 in the online group dropped out before completing the post-assessment. The results showed that the online and the face-to-face group differed significantly in only one subscale: the therapists' ratings of the tasks subscale were significantly higher in the online group. Furthermore, significant correlations were found between clients' ratings of the working alliance and therapy outcome at post-treatment in the online group and at both mid- and post-treatment in the face-to-face group (specifically, the

composite score and tasks subscale in the face-to-face group at mid-treatment and, at post-treatment, the tasks subscale in the online group and the composite score and the tasks and goals subscales in the face-to-face group). The correlations were moderately high, ranging from r = -.42 to r = .52. Contrary to what might have been expected, correlation analysis did not reveal the working alliance ratings as predictors of the BDI residual gain score.

Brief discussion

As the first randomized controlled trial to focus on depression in this context, this study highlighted that the working alliance in the online group was comparable to that in the face-to-face group. However, the results showed no significant relations between the BDI residual gain score and the working alliance ratings in either group. These findings support a suggestion Knaevelsrud and Maercker (2007) discussing that the working alliance might be more an "additional indirect measure of outcome" than a predictor of treatment outcome. In general, this study contributes to a better understanding of the working alliance in internet-supported therapeutic interventions, replicating previous findings (e.g. Cook & Doyle, 2002; Knaevelsrud & Maercker, 2007) showing that a strong working alliance can be established in an online setting, comparable to that established in face-to-face settings.

Paper 3

Background

Life-review intervention (LRI) has been recognized as an effective therapeutic approach for depression in old age (Bohlmeijer, Smit, & Cuijpers, 2003) and has been defined as a structured, time-limited and evaluative intervention (Haight & Haight, 2007; Pinquart & Forstmeier, 2012). Life-review intervention focuses on the balance of positive and negative reminiscence, the redefinition of negative experiences and elaboration of memory (Maercker, 2002). Moreover, as shown in paper 1, e-health interventions targeting older adults have been recognized as a promising approach for a variety of domains including depression, and therapeutic software has been used successfully as a supplement in traditional face-to-face therapy (Parsons & Rizzo, 2008). To our knowledge, to date, there are no randomized controlled trials investigating life-review intervention in a combined setting (face to face with computer supplements) for older adults suffering from depression.

Method

The aim of the randomized controlled trial presented in paper 3 was to investigate a six-week life-review intervention in a face-to-face setting with additional use of two computer modules of the e-mental health Butler system (Botella et al., 2009). Older adults aged 65 or over were randomized to a treatment group or a waiting-list control group. Assessments were conducted at baseline and at post-treatment, and participants in the intervention group also participated in a 3-month follow-up session. The participants completed

the Beck Depression Inventory, the Rosenberg Self-Esteem Scale, the Life Satisfaction Index – A, the Reminiscence Questionnaire, and the WHO-Five Well-Being Index.

Results

20 individuals participated in the intervention group and 16 individuals in the waiting-list control group. Additionally, 14 participants of the intervention group completed the 3-month follow-up. 1 participant in the intervention group and 3 in the control group dropped out before starting the treatment. Results showed significant changes from pre- to post-treatment or follow-up for *depression* (pre to post: d = 1.13; pre to follow-up: d= 1.27; group x time effect pre to post: d = 0.72), *well-being* (pre to follow-up: d = .70), *self-esteem* (group x time effect pre to post d = .19), and *obsessive reminiscence* (pre to follow-up: d = .93), but not for integrative reminiscence and life satisfaction.

Brief discussion

In general, the results of this study revealed medium-to-high effect sizes, indicating that a life-review intervention in a face-to-face setting with computer supplements could be recommended for older adults aged 65 or over. We were able to replicate previous findings on traditional face-to-face life-review interventions (Bohlmeijer, et al., 2003; Pot, et al., 2010; Serrano, et al., 2004). To our knowledge, this is the first randomized controlled trial in this context, and therefore our study contributes to providing a better understanding of the effects of life-review intervention with computer supplements on depression among older adults.

Overall discussion and outlook

As highlighted above, the three research articles of this thesis (papers 1-3) dealt in a broader sense with internet-supported therapeutic interventions for depression in adulthood and old age. Besides different settings (online therapy and a combined setting of face-to-face contact and computer supplements), two therapeutic approaches were addressed in papers 2 and 3: cognitive behavioural therapy and life-review intervention. Since the three research articles of this thesis provide a detailed discussion on this particular aspect of research including limitations, this discussion will address future directions in research in the fields in general.

Future directions in research on internet-supported therapeutic interventions

As discussed above, there is growing research on internet-supported therapeutic interventions, showing promising results (Barak, Hen, Boniel-Nissim, & Shapira, 2008; Barak, Klein, & Proudfoot, 2009). Nevertheless, the field still faces unresolved questions (Andersson, Carlbring, Berger, Almlov, & Cuijpers, 2009). Little is yet known about the target group, i.e. who should be considered for internet-supported therapeutic interventions and who for face-to-face psychotherapy. Further research is needed to address these questions or others focusing on predictors, mediators or moderators of treatment outcome in internet-supported therapeutic settings. In addition, there is a lack of investigations into long-term effects of treatment outcomes (several months or years after the post-assessment) in this context (Andersson & Cuijpers, 2009).

As mentioned earlier in this synopsis, there are still open questions concerning diagnostic processes in internet-supported therapeutic interventions (Andersson & Cuijpers, 2009). In general, internet-supported therapeutic interventions and diagnostic procedures have basically been conducted in scientific settings. Little is known about processes in more realistic settings, e.g. including patients in primary care. Furthermore, the programs provided online focused generally on one disease, e.g. depression. Recently, Titov, Andrews, Johnston, Robinson, and Spence (2010) suggested and provided first evidence for a transdiagnostic (depression and anxiety) CBT internet treatment approach. Due to frequently occurring co-morbidities in realistic settings (e.g. primary care), research on transdiagnostic approaches is of great relevance. Andrews, Cuijpers, Craske, McEvoy, and Titov (2010) also address the relevance of internet-supported therapeutic interventions in relation to realistic, i.e. existing mental health services and leave the question open of how internet-supported therapeutic interventions can be integrated into the latter (probably in a stepped care design). Following Barak et al. (2009) on this point, it should be added that internet-supported therapeutic interventions are regarded as a contribution to the diversity of psychotherapeutic methods and under no circumstances as an attempt to replace other forms of psychotherapy.

In addition, research on internet-supported therapeutic interventions itself could foster investigations into, for example, traditional face-to-face CBT. Since in internet-supported therapeutic interventions, material (techniques, methods) is presented in a comprehensible manner and with a clear deadline, i.e. a defined end of treatment upon which the patient and therapist agree, research on online CBT (or other formats) has the potential

to advance research on face-to-face CBT (Andersson & Cuijpers, 2009) and address open questions in the field via new formats that may facilitate certain investigations.

Since, compared to CBT approaches, life-review (and related) interventions have been rather less considered for systematic research, and the former constituted the main research practical part of this thesis, future directions in this field are discussed in the following.

Future directions in research on life-review (and related) interventions

Recently, Webster, Bohlmeijer, and Westerhof (2010) discussed six limitations found in reminiscence research that were to some extent also addressed above by Westerhof, Bohlmeijer, and Webster (2010), and in paper 3:

(1) "*a lack of conceptual clarity* (e.g. discriminating reminiscence from life review),

(2) *a lack of evidence for some basic assumptions of life review* (e.g. that it is universal),

(3) *the conflicting evidence of the supposed therapeutic effects of reminiscence and life review*,

(4) *a relative paucity of psychometrically sound instruments*,

(5) *poor experimental design of some studies* (e.g. lack of appropriate control groups), and

(6) *weak theoretical connections"* (Webster, Bohlmeijer, & Westerhof, 2010, p.530).

The authors suggest that the field should address research from a more critical point of view. The lack of a theoretical framework was addressed critically in recent work by Webster et al. (2010) and Westerhof et al. (2010), who highlight future research directions in the field. Actually Pinquart and Forstmeier (2012) have usefully adopted this framework for their recent meta-analytical review about the effects of reminiscence interventions on psychosocial outcomes. Further, these approaches were addressed in paper 3. Webster et al. (2010) and Westerhof et al. (2010) state that reminiscence behaviour should be embedded in theories of life-span development, Webster et al. (2010) suggest following Paul Baltes. Reminiscence and life-review was initially related only to old age. Following approaches of life-span development, this view changed in such a way that these processes now refer to all age groups. Reminiscence and life-review are further regarded as multicausal and multidirectional, i.e. involve a variety of aspects and can change depending on situations. The authors further propose a multidisciplinary approach in research, which involves theories of plasticity (e.g. dementia). Forstmeier at al. (2011) have currently adopted this approach in an investigation of a CBT approach (integrating life-review therapy modules) for mild Alzheimer`s patients and their caregivers. Furthermore, reminiscence and life review should be interpreted in their context (individual, historical and cultural). Based on these assumptions, Webster et al. (2010) recently proposed a heuristic model of reminiscence that should be addressed in future research: focusing on all age groups in their individual context from a life-span perspective and drawing attention to moderators of different outcomes. Addressing the first point, that reminiscence and life-review should focus on all age groups, Pinquart and

Forstmeier (2012) highlighted in their recent meta-analysis that effect sizes were not lower for adolescents and adults than for older adults. These formats therefore seem to be suitable for all age groups.

Future directions in research on combined settings

As we were able to demonstrate for the first time the effectiveness of a life-review intervention conducted in a combined setting (face-to-face with computer supplements) (paper 3), one might add that besides the above-highlighted factors regarding contents of reminiscence and life review, the provided setting should be addressed further by more research in the field, either in a combined setting or in other internet-supported therapeutic approaches.

Andersson and Cuijpers (2009) point out the importance of research focusing on combined settings. Little is yet known about which parts (computer or face-to-face) contributed to the effect sizes and to which amounts. Integrating randomized controlled settings with a treatment-as-usual control group could be valuable regarding research on combined settings. Barak et al. (2009) add that in general, the latter two above-discussed definitions of terminology in internet-supported therapeutic interventions have received less consideration in research than the others: *Internet-operated therapeutic software* (e.g. virtual reality clinical applications as effective treatment applications, for instance for exposure therapy), and *other online activities* (e.g. e-mail, web-blogs, chat or other applications as supplements to a face-to-face therapy). Since these two are developments that were designed to be used in combined settings, drawing attention to them in this context is highly relevant. An example for a therapeutic software

that has been used successfully as a supplement in traditional face-to-face therapy is “Virtual Reality Exposure Therapy” (VRET) (Parsons & Rizzo, 2008), in which a computer tool (a simulation or virtual environment) can be used in a therapeutic setting for the treatment of anxiety and specific phobias.

In general, evaluation on combined settings follows a step-by-step design (Botella et al, 2009). A technique that has shown efficacy in a face-to-face setting (e.g. an imagination technique), is transferred into a computer setting and further evaluated in this setting. In a next step, this tool is used and evaluated in a combined setting (computer-tool and face-to-face intervention). To investigate which parts (computer or face-to-face) contribute to the effect sizes and to which amounts, the comparison with a “treatment-as-usual” control group (including the same contents as the computer modules in a face-to-face setting) is most relevant.

Conclusion

To conclude, the relevance of focusing on specific psychotherapeutic methods (life-review intervention and cognitive behavioural therapy) for specific age-groups (adults, young-olds and old-olds) in different settings (online and face to face with computer supplements) for the treatment of depression in this thesis was highlighted by two basic facts: that depression is one of the most frequent mental disorders (with changing symptomatology in old age) and is associated with low treatment rates (Wittchen et al., 2011). Investigating new treatment approaches which address the individual needs of patients of several age groups in a modern society is therefore highly relevant. As shown in this thesis, the suggested approaches – even though

they face the above-addressed limitations – show evidence for their efficacy and will be advanced through fundamental research and multidisciplinary work of researchers and practitioners.

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Paper 1: E-Health Interventions for Depression, Anxiety Disorder, Dementia, and Other Disorders in Old Age: A Review

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Journal of CyberTherapy & Rehabilitation, 4(3), 371-385

Abstract

E-health interventions targeting older adults seem to be a promising approach in domains including depression, anxiety disorder, and dementia – three of the most prevalent mental disorders in old age. Further, these technical innovations (e.g., ambient assisted living and smart homes, game-based applications and training programs) may have the potential to compensate for or prevent health-related changes or to foster active aging. As highlighted by this literature review, however, research in this area is still at an early stage. The methodological quality of the studies and projects differs, and there is a lack of randomized controlled trials and robust research designs (much research to date has been limited to pilot and short-term studies). Advantages and challenges of using information and communication technology applications in the above-mentioned domains are discussed, as are user characteristics.

Keywords: e-health, older adults, depression, anxiety disorder, dementia

Introduction

E-health research focusing on the second half of the lifespan is still scarce. However, there is growing interest in the field and initial results are promising. A particular point of interest is whether older adults are familiar with information and communication technology (ICT) facilities such as computers and the Internet, and are thus able to benefit from health services provided through these media. A further question is whether these new media meet the needs of elderly people and have the potential to foster active and healthy aging. Kryspin-Exner and colleagues (Kryspin-Exner, Oppenauer, Preschl, & Maercker, 2009) have discussed e-health applications targeting older users and their caregivers, including assistive technology, tele-medicine, tele-monitoring, psycho-education, and support via the Internet. Further, older people are sometimes included in the adult samples of studies evaluating Internet-based therapeutic interventions, and increasing numbers of projects in this domain focus specifically on older adults. Against this background, this paper reviews research on e-health interventions involving older adults and their caregivers. We identified relevant articles, abstracts, and conference proceedings published in German or English by searching the appropriate databases (MEDLINE, Premedline, PsycCritiques, PsycINFO, PSYNDEXplus, PubMed/Medline, Web of Science) and the Internet (using google and google scholar) and by screening reference lists and the archives of the journal *Gerontechnology*. We searched for terms such as e-health, e-mental health, Internet, online, technology, intervention, therapy, old age, older people, caregivers, significant others, family members, gerontechnology, depression, anxiety, dementia, mobility, ambient assisted living, monitoring, and healthy ageing

(in various combinations). Because the number of completed high-quality studies in the field is limited, we also included reports on ongoing projects. Information on all of the articles included in the review is provided in Table 1.

A necessary condition for any technical device being used in old age is that the technology meets the needs of older adults and is accepted by this target group. Charness and Boot (2009) discussed research on attitudes toward technology in old age, as well as age-related changes in the perceptual, cognitive, and motor abilities that influence successful technology use. The authors concluded that age-related differences in technology use may decline over time, but will not disappear in future generations for two reasons. First, older people will continue to experience changes in their perceptual, cognitive, and motor abilities; second, technological development will continue to advance rapidly. It may be possible to decrease age-related differences further if product designers consider psychological guidelines (see Oppenauer, Preschl, Kalteis, & Kryspin-Exner, 2007, for a review of technology use in old age from a psychological perspective). Technology that considers and meets the needs of individuals across the lifespan is labeled gerontechnology: "[…] It helps support 'successful aging' […]. It focuses on the total human life-span […] and the encompassing of all domains of human activity. An enhanced quality of life in older adults is the ultimate goal of gerontechnology." (Bronswijk et al., 2009, p. 3).

Areas of E-Health Applications in Old Age

The Berlin Aging Study (BASE; Wernicke, Linden, Gilberg, & Helmchen, 2000) found *depression, anxiety disorder,* and *dementia* to be some of the most frequent mental disorders in old age. Many older people

suffer from mild or subsyndromal depression and show symptoms that do not reach the threshold criteria for Major Depressive Disorder (Forstmeier & Maercker, 2008; Maercker et al., 2008). Frequency of subsyndromal depression is related to age, polypathia, functional limitation, and need for help. In the following, we discuss the available research on e-health interventions for (1) depression, anxiety, and posttraumatic stress disorder (PTSD), and (2) dementia. As mentioned above, details of all studies described are presented in Table 1.

E-Health Applications for Depression, Anxiety, and PTSD

Samples in randomized controlled trial (RCT) studies of Internet-based therapeutic interventions for depression, anxiety, and PTSD often include older adults. Although these studies do not focus specifically on the second half of the lifespan or on age differences, their findings indicate that both older and younger individuals benefit from these interventions.

To our knowledge, findings from only one completed RCT study on e-health and depression in old age have been published to date. Focusing on older adults (aged 50–75 years, *N* = 301), Spek and colleagues (Spek, Cuijpers, et al., 2007) demonstrated that an Internet-based cognitive behavioral self-help intervention was effective in older people with subthreshold depression (BDI-II score below 20; Beck, Steer, & Brown, 2006). Relative to a waiting list control condition, the authors found a moderate effect size (0.55) for the Internet-based intervention – similar to the effects reported for an offline group cognitive behavior therapy intervention. Results from a one-year follow-up showed that these effects persisted over time (Spek et al., 2008).

An example of research on PTSD (secondary outcomes: depression, anxiety, etc.) in old age is a study currently being conducted by Knaevelsrud, Böttche, and Kuwert (2009, 2010) with adults aged 65 years and above (see www.lebenstagebuch.de). The sample currently comprises 74 patients who experienced traumatic situations as children, during or shortly after the end of World War II. These patients participated in a standardized, Internet-based cognitive behavioral writing therapy (Integrative Testimonial Therapy). Over six weeks, the patients wrote eleven texts and received feedback from a therapist. Results from 74 participants showed (among others) a decrease in PTSD symptoms (PDS, Foa, Cashman, Jaycox, & Perry, 1997) and depression (BSI, Derogatis, 1992).

Recently, Gamito and colleagues (2010) presented results from a pilot study (*N* = 10 war veterans, mean age: 63 years) on virtual reality exposure therapy (VRET). Participants were assigned to the VRET group (exposure to a virtual war scenario in 12 sessions), to control group (exposure in imagination), or to a waiting list. First results from this study showed a reduction in PTSD (CAPS, Blake, Weathers, Nagy et al., 1992) and psychopathological symptoms (SCL-90-R, Derogatis, 1994) in the VRET group.

The Butler system provides several *depression and anxiety* modules for older users (Botella et al., 2009). The system contains two therapeutic modules based on life review and autobiographical memory: the *therapeutic book of life* and positive mood induction modules for depression and anxiety. The latter are *Virtual Environments (VE)* in which the user learns techniques to reduce negative mood and to recall positive autobiographical memories. The *book of life* is a 3D adaptation of a book containing several chapters that

can be customized by users (to include text, pictures, and Mp3 music files). Besides therapeutic modules, the Butler system offers diagnostic (depression and anxiety) and “playful”/social interaction modules. All applications are guided by a personalized icon, the so-called “butler.” Results from a pilot study (*N* = 4, pre-post comparison) showed an increase in positive emotions and a decrease in negative emotions in older users (visual analogue scales; Botella et al., 2009). In addition, the participants reported high levels of satisfaction and experienced little difficulty in using the system.

We are currently using the depression modules of the German version of the Butler system as supplements to a face-to-face setting in an intervention study with older adults aged 65 to 75 years who show mild to moderate depression (Preschl, Wagner, Forstmeier, & Maercker, 2010). The treatment is based on recent advances in the context of life review interventions (Bohlmeijer, Smit, & Cuijpers, 2003; Haight & Haight, 2007; Maercker, 2002; Maercker & Zöllner, 2002; Serrano, Latorre, Gratz, & Montanes, 2004) and computerized mood induction (Banos et al., 2004; Banos et al., 2005; Riva et al., 2007) in old age. Both parts of the intervention focus on inducing positive memories and positive mood. Results from a pilot study (*N* = 3) show a decline in depressive symptoms (BDI-II, Beck, Steer, & Brown, 2006), an increase in quality of life (WHO-5, WHO 1998), as well as good participant acceptance of the computer modules (exploratory data). Further, the participants reported improvements in meaning of life (LAP-R, Mehnert, Müller, & Koch, 2007) and reminiscence strategies (RQ, Mayer, Filipp, & Ferring, 1996). We are currently conducting an RCT study (waiting list control condition) focusing on these outcome variables.

Rosenberg and colleagues (2010) recently presented results from a pilot study of a game-based intervention for older adults with subsyndromal depression. Nineteen older adults aged 63–94 years participated in a 12-week physical activity program based on Nintendo's Wii sports (five games: tennis, bowling, baseball, golf, and boxing). Results showed improvements in depression (QUIDS, Rush, et al., 2003), mental health-related quality of life (SF-36, Ware & Sherbourne, 1992), and cognitive performance (RBANS, Randolph, Tierney, Mohr, & Chase, 1998).

E-Health Applications for Dementia Patients and Their Caregivers or Significant Others

We identified three RCT studies and several ongoing projects, as well as work to develop and evaluate various prototypes. The REACH project (Resources for Enhancing Alzheimer's Caregiver Help) is an initiative for caregivers of people with (mild to moderate) Alzheimer's disease (Schulz et al., 2003). This six-site project in the USA investigated a variety of interventions (e.g., monitoring of caregiver stress, computerized telephone support). Between 100 and 257 caregivers (mean age: 61.1–68.5 years) participated in RCT intervention studies at each site. Caregivers showed reduced stress and higher skill acquisition after the intervention (main outcome measure: CES-D, Radloff, 1977).

Results from an RCT study (N = 66) of an Internet video-conferencing group intervention program for family caregivers of older adults with Alzheimer's disease, stroke-related dementia, or Parkinson's disease showed a decline in stress (3-point scale measuring severity of experienced stress and RMBPC, Teri, et al., 1992) among the participants after 10 weeks

(Marziali & Donahue, 2006). Note that the caregivers were older adults themselves, with an average age of 67.8 years.

Mahoney, Tarlow, and Jones (2002) evaluated a preventive multimedia program (CD-ROM) providing psycho-education about symptoms of Alzheimer's disease and "normal" memory loss. Their RCT study involved 113 older adults (mean age: 72 years). Beside promising results on the usability of the program, the authors reported highly significant differences between the intervention and the control (no program) groups, with individuals in the intervention group showing significantly more knowledge about memory loss (KMLT, Mahoney, Tarlow, & Jones, 2002).

Pot and Blom (2009) are currently conducting a web-based intervention program (online counseling) for family caregivers of people with dementia. To date, 60 individuals have started the intervention program, which involves eight sessions plus a booster session one month later. The aim of the intervention, called *mastery over dementia*, is to reduce depressive symptoms and caregiver burden and to improve coping strategies.

Riikonen, Mäkelä, and Perälä (2010) have evaluated 29 technologies for dementia patients (age range: 54 to 90 years), including risk-prevention technology (e.g., cooker/door alarm, monitoring system), assistive technology (e.g., electronic medication dispenser), and emergency technology (e.g., safety alarm telephone, monitoring system). Results obtained from 25 individuals with dementia and their family caregivers show that these devices have the potential to prolong independent living and to reduce caregivers' stress (NPI, Cummings et al., 1994).

Recently, Alm and colleagues (2009) presented positive (essentially qualitative) results for three technological approaches focusing on the provision of enjoyable activities for people with dementia (*N* = 5–40 depending on the prototype). An interactive system provides entertainment, facilitates communication, and fosters creativity in this target group. In a 3D environment, users have various options to explore and enjoy virtual surroundings (a hothouse in a botanic garden, a museum, and an old-fashioned pub), play games, be creative (e.g., paint a virtual pot or compose a piece of music), or enter into conversation via a system called CIRCA. The idea of CIRCA is to facilitate communication between people with dementia and their carers using individual reminiscence (video, music, and photographs) and to overcome the barriers of short-term memory loss that often obstruct communication.

Libin and Cohen-Mansfield (2004) have investigated the use of therapeutic robotic pets (two cats) for patients with dementia in a setting similar to traditional pet therapy. As dementia patients may no longer be able to care for a real pet, a robotic pet could function as an alternative. Results of a pilot study showed decreased agitation and increased pleasure and interest after engaging with the robotic pets. Another robotic pet for dementia patients is AIBO (Yonemitsu, Higashi, Fujimoto, & Tamura, 2002). In a case study (*N* = 4), AIBO was found to enhance communication with the robotic pet as well as among patients. Further, Odetti and colleagues (2007) have presented positive results on acceptance of the system (*N* = 23, mean age of participants: 76.6 years).

An example of ongoing research in the field of dementia is the COGKNOW project. Dröes and colleagues (2009) have recently developed a

prototype electronic assistant providing older people with mild dementia with support in the domains of memory, social contact, daily activities, and psychological distress (*N* = 90 older adults and caregivers were involved in the design process). Another ongoing project is the development of the ALADDIN platform aiming to support patients and their caregivers in terms of disease self-management (Haritou, 2009). The system will monitor patients' health parameters and assess cognitive and behavioral functions as well as activities of daily living. Further, ALADDIN will provide risk assessment, security features, and social network utilities. Another system that may be more relevant at an advanced stage of dementia, when patients at increasing risk of getting lost, is the Global Positioning System (GPS) currently being developed by Willemse, Horjus, and Pot (2009). It has been suggested that this system will help people with dementia to live independently in familiar surroundings for as long as possible.

The ENABLE project (http://www.enableproject.org/index.html) also merits consideration. The general aim of this project was to develop and evaluate technical devices for people with dementia: devices to support memory (e.g., medication reminder), to provide pleasure and comfort (e.g., a picture gramophone), and to facilitate communication (e.g., a pre-programmable telephone). Results showed that the products tested could help people with dementia, but the successful use of a device was related to its operational reliability. Technology for this target group needs to be comfortable, secure, and safe.

More Complex Age-Appropriate Approaches

Individuals in the second half of the lifespan face challenges in a variety of domains: decline in sensory, motor, and cognitive abilities; multi-morbidity and chronic disease; difficulty performing Activities of Daily Living (ADL) and instrumental Activities of Daily Living (IADL) (bathing, dressing, preparing meals, shopping, leisure activities, etc.); and changes in social relationships (Forstmeier & Maercker, 2008). Interventions are thus needed to facilitate active participation in social life as well as physical and mental wellbeing across the lifespan – that is, to foster *active aging*: "Active Ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age" (WHO, 2002, p. 12). Key components of this concept are autonomy, independence, quality of life, and a healthy life expectancy. In the following, we present findings from studies of ICT interventions designed to foster active aging and to compensate for or prevent common health-related changes in old age.

Ambient Assisted Living (AAL) and Smart Homes

Ambient assisted living (AAL) and smart homes are technologies designed to enhance older people's quality of life and to help them remain independent (i.e., in their own homes) for as long as possible (Chan, Campo, Esteve, & Fourniols, 2009; Demiris, 2008; Huch, 2009). These devices are developed to compensate for age-related changes in domains such as mobility/safety and sensory, memory, or social skills, and to provide help with ADLs or to monitor health parameters in case of chronic disease. The common ground of these initiatives is that they foster in-home self-care, as opposed to hospital/institutional care (Chan et al., 2009; Huch, 2009), thus

prolonging independent living and helping to combat the increasing costs of health care systems in aging societies. Chan and colleagues (2009) have identified ethical and legal issues and individual needs that have to be considered in this context, especially with regard to monitoring devices. For example, it is significant whether or not users are able to make an informed choice and give informed consent. Further, the privacy concerns of monitored users have to be considered (Chan et al., 2009; Charness & Boot, 2009). Privacy can be increased by using less invasive technology, such as monitoring systems that do not allow the user's face to be clearly identified (Caine, Fisk, & Rogers, 2006). In the following, we provide some examples of smart home and AAL solutions in the above-mentioned domains. To our knowledge, no RCT studies have yet been conducted in this field; research in this area is still at a very early stage.

The COGKNOW project (Dröes et al., 2009) is an example of a smart technology solution providing memory and social support. For example, the system can remind the user to telephone a significant other or to close the front door. If the user wants to phone a family member or friend, the system automatically connects to that person. Assistive social robots are another kind of smart solution facilitating social contact. In their review of research in this area, Broekens, Heerink, and Rosendal (2009) drew attention to the lack of RCTs and robust research designs (much of the research to date has been limited to pilot and short-term studies). The reason for these deficits may be that research in this domain – as in other e-health domains in old age (Chan et al., 2009) – is in its early stages (no studies about assistive social robots were published before 2000). Beyond these concerns, the existing research on assistive social robots has provided limited qualitative and

quantitative evidence for positive effects of these technological solutions on health and psychological well-being in old age.

GEROHOME is an example of an automatic monitoring system of ADLs such as preparing a meal (Anfosso & Bourdeau, 2009). Preliminary results from two case studies (with participants aged 64 and 85 years) indicate that the system is able to detect different ADL levels. Franco and colleagues (Franco, Gallay, Berenguer, Mourrain, & Couturier, 2008) presented similar results, showing that another monitoring system (*N* = 13, mean age: 83) was able to differentiate daily and nocturnal ADL levels. The idea behind automatic monitoring of ADLs is to gain further insights into physical and mental health conditions and to identify problems, thus informing the development and targeted implementation of preventive and support measures. There are two main monitoring approaches (Anfosso & Bourdeau, 2009). One is to measure bio-signals such as blood pressure or body temperature in people with chronic disease by means of wearable devices (Bestente et al., 2008; Lee et al., 2008). These data are sent to and recorded at a local base station and provide caregivers with information about the health status of the older person, allowing them to initiate (emergency) assistance where necessary. The other main monitoring approach is to use sensors embedded in the house (e.g., to warn the resident that the oven is on). Recently, Reder, Ambler, Philipose, and Hedrick (2010) conducted a pilot study (*N* = 12, age 55+ years) involving remote monitoring of four domains (meal preparation, physical activity, vitamin use, and personal care) with older adults and their caregivers over a 3-month period. Results from qualitative interviews indicated satisfaction with the system and positive outcomes on various psychological variables

(perceived safety, well-being, peace of mind, independence). However, the subjects identified privacy concerns and technical problems as barriers.

In a short overview, Huch (2009) introduced the Ambient Assisted Living for Europe initiative, including a variety of ongoing international projects (listed in Huch, 2009, p. 114). The VITALIshoe project (Hlauschek, 2009) is an example of a technological device designed to promote mobility/safety. This instrumented shoe was developed to prevent falls by monitoring motion patterns and training balance, thus enhancing the activity levels of older adults on the long term. In the sensory domain, the Hear Me Feel Me project (http://www.hearmefeelme.org) uses mobile phone technology to compensate for visual impairment. In this approach, a mobile phone provides speech synthesis and audio input and output as well as the possibility to connect to the Internet. The user can thus access several services: medication and medicine-related information and services, health monitoring, and diet information.

Game-Based Applications and Training Programs to Foster Active Aging

Fozard, Bouma, Franco, and Bronswijk (2009) have discussed the use of technology to address the needs of this target group beyond health-related challenges – specifically, the use of leisure technology to help older adults have fun and to enjoy life. Although the authors concluded that little is known about the application of these technologies in this context, some research in this field is available. Gamberini and colleagues (Gamberini et al., 2008) reviewed game-based applications for older people, finding them to have positive affects on cognitive abilities as well as on social and emotional variables. The ElderGames project is an example of a game-based

technology that allows older users to play and interact together while implicitly their training problem-solving strategies, psychomotor abilities, etc. (Gamberini et al., 2006; Gamberini et al., 2008). The authors report good results in terms of usability (*N* = 4, mean age: 68 years), acceptance (*N* = 107) and monitoring of cognitive abilities (*N* = 59) (Gamberini et al., 2009). Further, Basak, Boot, Voss, and Kramer (2008) showed that playing a strategy video game enhanced cognitive functioning in older adults. After participating in a game tutorial, the participants (20 in a training group, 20 in a control group) spent a total of 23.5 hours over 4 to 5 weeks playing the game. Another program focusing on physical and social interaction is Age Invaders (Khoo, Merritt, & Cheok, 2009). In this game, various family members (children, parents, and grandparents) play together via the Internet (e.g., avoiding laser beams). The system was tested with 7 older players aged 64–78 years; findings on its usability were encouraging. Finally, Charness and Boot (2009) discussed the effects of games on cognitive and perceptual abilities and well-being. The authors found positive results in this field to be limited (e.g., self-reported functioning). Further research should focus on more objective outcome measures and on the transfer of the trained functions to real life.

Further, there is some literature on game-based and rehabilitation programs for motor and other abilities. Erren-Wolters and colleagues (Erren-Wolters, van Dijk, de Kort, Ijzerman, & Jannink, 2007) reviewed the literature on virtual reality applications designed to train the mobility of younger and older people. The authors found the methodological quality of the studies to range from poor to fair. Again, these findings testify to the novelty of the field, with research still being in its early stages. Nevertheless, first results seem to

indicate the potential of virtual reality applications to train mobility and thus foster the real-life use of mobility devices. For example, Giotakis, Tsirgogianni, and Tarnanas (2007) presented findings from a rehabilitation training program based on virtual reality exposure therapy (VRET). During the intervention, 68 older adults (mean age: 76.8) completed several tasks (e.g., walking on virtual slippery streets). Results show reduced fear of falling (FES-I, Yardley et al., 2005) and increased balance confidence (ABC, Powell, & Myers, 1995). TheraGame is another example of a virtual reality training program in which the user learns to navigate virtual objects (Kizony, Weiss, Shahar, & Rand, 2006). Results from 12 healthy older adults and 4 patients with neurological deficits aged 65 to 76 showed that enjoyment and usability of the system were high. Likewise, Rand, Kizony, and Weiss (2008) found a virtual reality system (Sony PlayStation II Eyetoy) designed to train patients after stroke to have good usability. Ten healthy older adults and 12 stroke patients aged 50 to 80 participated in the usability studies. Participants trained their motor function in a game-based virtual environment (e.g., playing Kung-Foo).

Table 1. Articles Included in the Review

Authors (name of project)	Area of interest	Format	*N*	Age of participants (in years)	Research design	Source	Selected findings
	Depression/ anxiety			**60–94**			
Botella et al. (2009) (Butler/ Mayordomo)	Depression/ anxiety	E-Health platform, prototype	4	66–74	Pre-post comparison (pilot study)	Peer reviewed journal	Increase in positive and decrease in negative emotions (visual analogue scale)
Gamito et al. (2010)	PTSD	Virtual reality (VRET)	10	Mean age: 63	Pilot study, waiting list control group and other treatment	Peer reviewed journal	Reduction of PTSD (CAPS) and psychopathological symptoms (SCL-90-R)
Knaevelsrud et al. (2009; 2010)	PTSD, further depression/ anxiety	Internet-based therapeutic intervention	74 (ongoing)	65+	RCT, waiting list control group	Conference proceedings	Improvement in PTSD (PDS) and depression (BSI)
Preschl et al. (2010) (Butler)	Depression	E-health supplement to face-to-face setting	3	65–75	Pre-post comparison (pilot study); authors are currently conducting an RCT study (waiting list)	Conference proceedings	Improvement in depression (BDI-II), quality of life (WHO-5), meaning of life (LAP-R), reminiscence strategies (RQ)
Rosenberg et al. (2010) (Nintendo's Wii sports)	Depression	Game	19	63–94	Pre-post comparison	Peer reviewed journal	Improvement in depression (QUIDS), mental health-related quality of life (SF-36), cognitive performance (RBANS)
Spek et al. (2008); Spek, Nyklicek, et al. (2007) (follow-up)	Depression	Internet-based therapeutic intervention	301	50–75	RCT, waiting list control group	Peer reviewed journal	Improvement in depression (BDI)
	Depression/ anxiety			**18–75**			
Cavanagh et al. (2006) (Beating the Blues)	Anxiety/ depression	Computerized therapy package	219	19–70	Pre-post and follow-up comparisons	Peer reviewed journal	Improvement in self-reported anxiety and depression (single-item 9-point scale)
Kessler et al. (2009)	Depression	Internet-based therapeutic intervention	297	18–75	RCT, waiting list control group	Peer reviewed journal	Recovery from depression (BDI)
Knaevelsrud & Maercker (2007)	PTSD, further anxiety and depression	Internet-based therapeutic intervention	96	18–68	RCT, waiting list control group	Peer reviewed journal	Improvement in PTSD (IES), anxiety, and depression (SCL-90)
Proudfoot et al. (2004)	Anxiety/ depression	Computerized	274	18–75	RCT, control:	Peer reviewed	Improvement in depression

(Beating the Blues)		therapy package			treatment as usual	journal	(BDI)
Wagner, Knaevelsrud, & Maercker (2006)	Complicated grief, further anxiety and depression	Internet-based therapeutic intervention	55	18–68	RCT, waiting list control group	Peer reviewed journal	Improvement in PTSD (IES), anxiety and depression (SCL-90)
Wright et al. (2005)	Depression	Computer-assisted intervention (therapist contact and computer sessions)	45	18–65	RCT, waiting list control and face-to-face intervention group	Peer reviewed journal	Improvement in depression (HAMD and BDI)
	Dementia			**54–90**			
Alm et al. (2009) (CIRCA)	Dementia	Multimedia leisure system (proto-types)	5-40 (de-pen-ding on proto-type and phase of the design pro-cess)	Not specified (de-mentia patients and their carers)	De-velopment and evaluation of prototypes	Peer reviewed journal	Positive experience with the prototypes (essentially qualitative results)
Dröes et al. (2009) (COGKNOW)	Dementia, memory, social support	Electronic assistant	90 (45 de-mentia pa-tients; 45 ca-rers)	Not specified (de-mentia patients and their carers)	De-velopment and evaluation of a prototype	Con-ference pro-ceedings	Development of system providing personalized support
Haritou (2009) (ALADDIN)	Dementia	Platform for assisted living	Not spe-cified	Not specified (de-mentia patients and their ca-rers)	De-velopment and evaluation of a prototype	Con-ference pro-ceedings	Not specified (onging)
Libin & Cohen-Mansfield (2004)	Dementia	Robotic pet	9	83–98	Experiment, direct observation	Peer reviewed journal	Decreased agitation; increased pleasure and interest (main outcome measure: ABMI)
Mahoney et al. (2002)	Dementia, memory loss	Preventive multimedia program (CD-ROM)	113	Mean age: 72	RCT (use vs. non-use of program)	Peer reviewed journal	More knowledge about memory loss in the IG (KMLT)
Marziali & Donahue (2006) (Caring for Others)	Dementia and other mental disorders	Video-conferencin g group intervention	66	Mean age: 67.8	RCT, control: treatment as usual	Peer reviewed journal	Decrease in caregiver stress (3-point severity scale, RMBPC)
Odetti et al. (2007) (AIBO)	Dementia	Robotic pet	24	Mean age: 76.6	Experiment on acceptability (observation and single-item questions)	Confere nce proceedi ngs	System was accepted
Pot & Blom (2009)	Dementia	Online counseling	60 (star-ted, on-going)	Not specified (care-givers of de-mentia patients)	Pre-post and follow-up com-parisons (ongoing)	Con-ference pro-ceedings	Not specified (ongoing)
Riikonen et al.	Dementia	Home-	25	54–90	Explorative	Peer	Devices

(2010)		care: risk preventive, assistive and emergency technology			evaluation of various technical devices	reviewed journal	fostered independent living and decline in caregiver stress (NPI) in some cases
Schulz et al. (2003) (REACH)	Dementia	Various interventions for caregivers in 6 US sites (monitoring of stress and computerized telephone support)	100–257 caregivers (dependent on site)	Mean age: 61.1–68.5 (dependent on site)	RCTs, control: minimal support group or usual care	Peer reviewed journal	Improved coping; reduced stress and depression (dependent on site), main outcome measure: CES-D
Yonemitsu et al. (2002) (AIBO)	Dementia	Robotic pet	4	Not specified (older adults with dementia)	Direct observation	Peer reviewed journal	Increased communication
	Complex approaches			**55–85**			
Anfosso & Bourdeau (2009) (GEROHOME)	ADLs	Monitoring	2	64–85	Explorative test of system	Peer reviewed journal	System able to detect ADL levels
Basak et al. (2008)	Cognitive functioning	Game	40	Mean age: 68.88–70.05	Pre-post comparisons	Peer reviewed journal	Improvement in cognitive functions (APM and others)
Bestente et al. (2008)	Chronic disease	Monitoring	25	Not specified (older adults)	Development and test of a prototype	Peer reviewed journal	Not specified (system successfully tested)
Franco et al. (2008)	ADLs	Monitoring	13	Mean age: 83	Explorative test of system	Peer reviewed journal	System able to differentiate daily and nocturnal ADL levels
Gamberini et al. (2009)	Cognitive functioning and social interaction	Game	4 (usability evaluation) 107 (acceptance) 59 (monitoring cognitive abilities)	Mean age: 68	Usability studies and acceptance evaluation of prototype; pre-post comparisons	Conference proceedings	System user friendly and accepted, able to monitor cognitive abilities (fit with WASI)
Giotakos et al. (2007)	Mobility, rehabilitation	Virtual reality (VRET)	68	Mean age: 76.8	Pre-post and follow-up comparisons	Peer reviewed journal	Reduced fear of falling (FES-I) and increased balance confidence (ABC)
Hlauschek (2009) (VITALIshoe)	Mobility/safety: fall prevention	Instrumented shoe	Not specified (ongoing)	Not specified (older adults)	Development and evaluation of a prototype	Conference proceedings	Not specified (onging)
Huch (2009), http://www.hearmefeelme.org;	Sensory challenges	Mobile phone (NFC) technology,	Not specified (ongo-	Not specified (older adults)	Development and evaluation	Conference proceedings	Not specified (onging)

(Hear Me Feel Me)		connected to Internet	ing)		of a prototype		
Khoo et al. (2009) (Age Invaders)	Physical and social interaction	Game	7	64–78	De-velopment and usability studies of a prototype	Peer reviewed journal	Development of a system that fits the user's needs
Kizony et al. (2006) (TheraGame)	Rehabilitation	Virtual reality	16	65–76	Usability studies of the prototype, pre-post com-parisons	Con-ference pro-ceedings	Moderate to high levels of enjoyment (SFQ) and usability (SUS)
Rand et al. (2008) (Sony Playstation II EyeToy)	Rehabilitation	Virtual reality	22	50–80	Usability studies of the prototype, pre-post com-parisons	Peer reviewed journal	System feasible for older adults and stroke patients (SFQ and SUS)
Reder et al. (2010)	ADLs	Monitoring	12	55+	Pre-post comparison (pilot study)	Peer reviewed journal	Satisfaction with the system; increase in perceived safety, well-being, peace of mind and indepen-dence; qualitative interviews

Note: CAPS = clinician-administered PTSD scale; SCL 90 = Symptoms Checklist; RCT = Randomised Controlled Trial; PDS = Posttraumatic Stress Diagnostic Scale; BSI = Brief Symptom Inventory; BDI = Beck Depression Inventory; WHO-5 = WHO-Five Well-being Index; LAP-R = Life Attitude Profile–Revised; RQ = Reminiscence Questionnaire; QUIDS = Quick Inventory of Depressive Symptoms; SF36 = MOS 36-item Short-Form Health Survey; RBANS = Repeatable Battery for Assessment of Neurocognitive Status; HAMD = Hamilton Depression Scale; ABMI = Agitated Behaviours Mapping Instrument; KMLT = Knowledge about Memory Loss Test; RMBPC = Revised Memory and Behavior Problems Checklist; NPI = Neuropsychiatric Inventory; CES-D = Center for Epidemiologic Studies – Depression Score; ADLs = Activities of Daily Living; APM = Raven's Advanced Progressive Matrices; WASI = Wechsler Abbreviated Scale of Intelligence; VRET = Virtual Reality Exposure Therapy; FES-I = Falls Efficacy Scale – International; ABC = Activity-Specific Balance Confidence; SFQ = Short Feedback Questionnaire; SUS = System Usability Scale.

Conclusion

This literature review of e-health interventions targeting three of the most frequent mental disorders in old age – depression, anxiety disorders, and dementia – has identified a variety of studies and ongoing projects, the initial results of which are promising. We considered ICT solutions such as Ambient Assisted Living (AAL) and Smart Home technologies designed to compensate for or prevent health-related changes or to foster active aging in old age, as well as game-based applications and training programs. Our literature review included peer reviewed papers and randomized controlled trials as well as conference proceedings (i.e., ongoing projects) and papers reporting the results of pilot studies. Overall, the studies reviewed involved a total of 965 participants aged 65 years and above. There is a growing interest in this field and the idea of fostering active and healthy aging unites a variety of research fields and professions. Beyond the areas described in this literature review there are also new research areas developing. For example, *Second Life* has been used to entertain older people and overcome social isolation and loneliness (Boulos, Hetherington & Wheeler, 2007) and *Robot Suit HAL* (Hybrid Assistive Limb) has been shown to be a helpful device in the assistance of the user's limbs (e.g. the support of movement of arms and legs of older or disabled individuals; Sankai, 2006).

Our findings underline that research in the field of e-health for older individuals is still in its early stages. As previously reported (Broekens et al., 2009; Chan et al., 2009; Charness & Boot, 2009; Erren-Wolters et al., 2007), methodological quality varies, and there is a lack of randomized controlled trials (RCT) and robust research designs (much research to date has been limited to pilot and short-term studies). To our knowledge, findings from only

one completed RCT study on e-health and depression in old age (Spek et al., 2008; Spek, Nyklicek, et al., 2007) and three completed RCT studies on e-health and dementia in old age (Mahoney et al., 2002; Marziali & Donahue, 2006; Schulz et al., 2003) have yet been published.

Further, it remains to be seen whether prototypes investigated will reach the final phase of implementation and can be placed on the market. In addition, ethical and legal issues and individual needs warrant particular consideration in this context, especially where monitoring devices are concerned (Chan et al., 2009; Charness & Boot, 2009). Beyond these challenges, we identified some high-quality research and a variety of innovative ongoing research and pilot studies in the field. The promising results of these studies indicate that ICT may in the future be able to make a significant contribution to active and healthy aging.

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Paper 2: The working alliance in a randomized controlled trial comparing online with face-to-face cognitive-behavioral therapy for depression

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BMC Psychiatry, 11(1), 189.

Abstract

Background

Although numerous efficacy studies in recent years have found internet-based interventions for depression to be effective, there has been scant consideration of therapeutic process factors in the online setting. In face-to face therapy, the quality of the working alliance explains variance in treatment outcome. However, little is yet known about the impact of the working alliance in internet-based interventions, particularly as compared with face-to-face therapy.

Methods

This study explored the working alliance between client and therapist in the middle and at the end of a cognitive-behavioral intervention for depression. The participants were randomized to an internet-based treatment group (n = 25) or face-to-face group (n = 28). Both groups received the same cognitive behavioral therapy over an 8-week timeframe. Participants completed the Beck Depression Inventory (BDI) post-treatment and the Working Alliance Inventory at mid- and post- treatment. Therapists completed the therapist version of the Working Alliance Inventory at post-treatment.

Results

With the exception of therapists' ratings of the tasks subscale, which were significantly higher in the online group, the two groups' ratings of the working alliance did not differ significantly. Further, significant correlations were found between clients' ratings of the working alliance and therapy outcome at post-treatment in the online group and at both mid- and post-treatment in the face-to-face group. Correlation analysis revealed that the

working alliance ratings did not significantly predict the BDI residual gain score in either group.

Conclusions

Contrary to what might have been expected, the working alliance in the online group was comparable to that in the face-to-face group. However, the results showed no significant relations between the BDI residual gain score and the working alliance ratings in either group.

Background

In the past decade, accumulating research has demonstrated that internet-based interventions can have beneficial effects on psychological health [1]. There is particular interest in the use of new communications technologies for the treatment of depression. Adult depression has a high prevalence in the general population; it is associated with significant impairments in health and functional status, as well as with high economic costs [2]. Effective and cost-efficient treatment approaches that reach large populations are therefore needed.

Internet-based interventions for depression can be delivered in different forms, from self-help treatments delivered without therapist guidance to mainly text-based interventions with high therapist involvement [3-4]. However, research indicates that the treatment outcomes of internet-based interventions are related to amount of therapist involvement. In their meta-analysis of internet-based interventions for depression, Andersson and Cuijpers [5] found a strong influence of therapist support on treatment outcome. Computerized interventions with therapist support showed a mean between-group effect size of d = .61, which is comparable with face-to-face treatment for depression, whereas interventions with little or no therapist contact had a significantly smaller treatment effect size of d = 0.25. This pattern of results replicates the findings of a previously published meta-analysis [6]. Moreover, studies on entirely self-guided programs have shown not only reduced treatment effects, but also substantial attrition rates of up to 41% [7-11]. Analyses have also revealed a significant correlation between the amount of therapist time in minutes per participant and the between-group effect sizes of internet-based interventions [12]. Based on the findings

of their Swedish studies, Andersson and colleagues have suggested that it can be sufficient for the therapist to spend about 100 minutes per patient over a 10-week program giving comments on patients' homework and providing feedback [13]. The latest studies indicate that increasing therapist contact time beyond a certain threshold may not facilitate further treatment gains [14]. In his review, Titov [15] concluded that highly standardized internet-based interventions with low-intensity therapist support can achieve excellent clinical outcomes. Overall, these studies on internet-based interventions for depression thus suggest that a minimum of human therapeutic contact is needed to reduce attrition rates and to alleviate symptoms of depression.

Despite the growing interest in the influence of therapist support (e.g., therapist time spent per patient) in internet-based interventions, there has been little research on therapeutic process factors and predictors of treatment outcome in online settings. It therefore remains unclear whether the factors and therapeutic processes that are responsible for symptom reduction in face-to-face therapy operate in the same way in online therapeutic settings. We expect more factors to be involved than the mere amount of time that the therapist spends giving feedback to patients.

Therapeutic alliance

One of the therapeutic process factors associated with treatment outcome is the working alliance between therapist and patient. Numerous empirical studies have demonstrated the importance of the working alliance—that is, the relationship or collaboration between therapist and patient—for therapeutic outcomes in conventional treatment settings [16]. It

has also been noted that clients' assessments of the therapeutic alliance are more predictive than are therapists' or observers' ratings. Krupnick and colleagues [17] demonstrated that the therapeutic alliance significantly influenced symptoms of depression as outcome measures. They found significant predictive effects for patient ratings, but not for therapist ratings. In view of these findings, the therapeutic alliance has traditionally been seen as a key element adding to the treatment success of face-to-face psychotherapy [16]. Against this background, the fact that internet-based interventions involve less therapeutic contact—not only in terms of time, but also through their restriction to purely text-based and computer-mediated communication—may be a cause for concern. However, there has to date been little empirical research on the impact of the working alliance in online settings as compared with face-to face therapeutic settings.

Cook and colleagues [18] were among the first to evaluate the online working alliance. They compared results from an online sample (N = 15) with normative data from a representative sample in face-to-face therapy (N = 25). The online group showed higher means on the composite score and the goals subscale of the Working Alliance Inventory [19]. The goals subscale reflects the agreement between therapist and client on what is to be achieved in the therapy. However, these preliminary results should be interpreted carefully: the sample size was small and patients were not randomly allocated to the conditions. In the same vein, Reynolds and colleagues [20] reported preliminary results (N = 16 therapists, N = 17 clients) on the therapeutic alliance as assessed by the Agnew Relationship Measure [21] in an online setting, which they compared with existing data from a face-to-face group. The clients in the online study presented with depression, stress,

anxiety, or childhood abuse. Like Cook and Doyle [18], the authors reported similar therapeutic alliance ratings for both conditions, with the online groups showing higher means on the confidence subscale. In a randomized controlled study, Knaevelsrud and Maercker [22] compared the therapeutic alliance in a total of 96 PTSD patients assigned at random to an internet-based treatment or a waiting list control group. The treatment involved 10 writing assignments, on which therapists gave detailed feedback. The authors reported relatively low drop-out rates (16%) and relatively high scores for the therapeutic alliance (Working Alliance Inventory, patient ratings: M = 6.3, therapist ratings: M = 5.8). These results were again comparable with face-to-face therapy, indicating that a strong therapeutic relationship could be established even in an online setting with no direct personal contact. Further, the composite scores of both the therapists' and the clients' ratings of the therapeutic alliance late in treatment were moderately but not significantly correlated with treatment outcome [23].

Beside these studies of internet-supported therapeutic interventions with therapist support based on computer-mediated communication without the use of a specific self-help program, Klein and colleagues [24] and Kiropoulos and colleagues [25] have reported positive results on the therapeutic alliance in therapist-assisted internet programs. In a randomized controlled trial, Kiropoulos and colleagues compared a 12-week internet-based cognitive behavioral therapy (CBT) for panic disorder and agoraphobia provided via the online program *Panic Online* with face-to-face CBT (*N* = 86). The program combines standardized instructions and information with e-mail contact with a therapist. Patients in the internet-based group had significantly less therapist contact than those in the face-to-face group. Nevertheless,

both groups rated the intervention as similarly satisfying (Treatment Satisfaction Questionnaire–Modified, TSQ; [26]) and credible (Treatment Credibility Scale, TCS-M; [27]). However, participants in the face-to-face group enjoyed communication with their therapist more than did those in the internet-based group, and their therapists reported higher compliance to treatment (Therapist Alliance Questionnaire, TAQ; modified version of the Helping Alliance Questionnaire, HAQ; [28]). In an open trial, Klein and colleagues investigated a therapist-assisted internet CBT for PTSD provided via the interactive CBT program *PTSD Online*. These authors reported 194.5 min of therapist time spent across the 10-week intervention. Nevertheless, the participants (N = 22) gave high therapeutic alliance ratings (87.5%) on the Therapeutic Alliance Questionnaire, TAQ.

Based on these findings, we conducted a randomized controlled study investigating the therapeutic alliance in online (computer-mediated communication without the use of a specific self-help program) and face-to-face CBT treatment settings for depression. To our knowledge, this is the first randomized controlled trial for depression to compare the therapeutic alliance between patient and therapist in the two settings in an experimental design. To maximize comparability, all patients received the same treatment manual over the same timeframe. The treatment manual was based on a German CBT treatment manual for depression [29] with an added life-review intervention module [30]. The first objective of this study was to examine whether the therapeutic alliance was comparable in the online group and the face-to-face group. Second, we investigated whether the therapeutic alliance predicted depression as outcome in the online and/or face-to-face condition.

Third, we examined the therapeutic alliance from the therapists' perspective as a predictor of treatment outcome in both conditions.

Method

Study design

A randomized controlled trial comparing an internet-based with a face-to face CBT intervention for depression was conducted at the University of Zurich [31]. Both treatment groups received the same cognitive behavioral therapy over an 8-week timeframe, at the end of which participants completed the Beck Depression Inventory and the Working Alliance Inventory. Assessments were conducted at baseline and post-treatment.

Participants

Participants were recruited between November 2008 and February 2010. The institutional review board at the University of Zurich approved the study. Patients were recruited through advertisements in newspapers, the depression website of the university, local internet news forums, and depression self-help groups, advertisements in supermarkets and pharmacies, and local press releases. Inclusion criteria were a score of at least 12 on the Beck Depression Inventory (BDI) [32] and age 18 years or older. Demographic characteristics of the sample are presented in Table 1.

The average BDI baseline score was M = 22.5 (S.D = 6) for the online group and M = 23.6 (SD = 7.9) for the face-to-face group. The BDI baseline scores of the two groups did not differ significantly, $t(50) = -0.567$; $p > .05$. Information on post-treatment BDI scores and associated test statistics are

reported elsewhere [31]. Preliminary results for the primary outcome (depression) revealed no differences between the online and the face-to-face condition.

Table 1: Sample characteristics.

Characteristics	Total sample (n = 53)	Online group (n = 25)	Face-to-face group (n = 28)	Comparison (df)
Age, M (SD) (in years)	36.7 (10.9)	34.9 (9.5)	38.3 (11.9)	F(.91) = .25, ns
Gender (female)	36 (67.9%)	21 (84%)	15 (53%)	$\chi^2(1)$, $p < .01$
Marital status				$\chi^2(3)$ = .58, ns
Single	31 (58.5%)	15 (60%)	16 (57%)	
Married/cohabiting	9 (17%)	4 (16%)	5 (18%)	
Divorced	6 (11.3%)	4 (16%)	2 (7%)	
Widowed	7 (13.2%)	2 (8%)	5 (18%)	
Educational level				$\chi^2(2)$ = .21, ns
Vocational-track sec. school	11 (20.8%)	3 (12%)	8 (28%)	
Intermediate-/academic-track sec. school	20 (37.7%)	12 (48%)	8 (28%)	
University degree	22 (41.5%)	10 (40%)	12 (43%)	
Employment status				
Full-time work	36 (97.9%)	18 (72%)	18 (64.3%)	
Unemployed	11 (20.8%)	5 (20%)	6 (21.4%)	
Sick leave	4 (7.5%)	1 (4%)	3 (10.7%)	
Retired	1 (1.9%)	1 (3.6%)		
No antidepressants	43 (81.1%)	23 (92%)	20 (71%)	$\chi^2(1)$ = .14, ns
Previous face-to-face psychotherapy	28 (52.8%)	13 (52%)	15 (54%)	$\chi^2(1)$ = .54, ns

Visits to medical doctors in last 12 months, M (SD)	4.5 (5.3)	5.2 (5.5)	3.78 (4.9)	F(.002) = .30, ns
Where did you hear about the study?				
Internet	30 (56.6%)	13 (52%)	17 (60.7%)	
Newspaper	12 (22.6%)	5 (20 %)	7 (25%)	
Radio	2 (3.8%)	2 (8%)		
Family/friends	1 (1.9%)	1 (4%)		
Self-help group	3 (5.7%)	3 (12%)		
Bulletin	4 (7.5%)	1 (4%)	3 (10.7%)	
Caregiver (psychologist, primary care physician)	1 (1.9%)		1 (3.6%)	

Procedure

A web page was created for the study, presenting general information about CBT and its effects in treating depression, and giving an outline of the study. Participants indicated their interest in the study by contacting the intake coordinator via the e-mail address indicated on the website (for further information, see [31]). The intake coordinator sent a reply e-mail with a patient information sheet and the inclusion and exclusion criteria. Participants who indicated that they met and were comfortable with the requirements entered an online screening procedure, data from which were later used as pretest measures. After confidentiality issues had been addressed, eligible applicants returned a signed informed consent form—which informed them about potential risks and benefits of study participation—by fax or post. The treatment commenced 3 to 4 days after the patients had returned their

informed consent form. The intake coordinator told participants that they could withdraw from the study at any time. Further, participants received 24-hour contact numbers for emergency situations or crises. They were also encouraged to call or e-mail the therapist or intake coordinator at any time during their participation in the study in case of distress or crisis. Participants were randomly assigned to one of the two conditions as they were included in the study. Applicants excluded from the study were informed about other available forms of treatment.

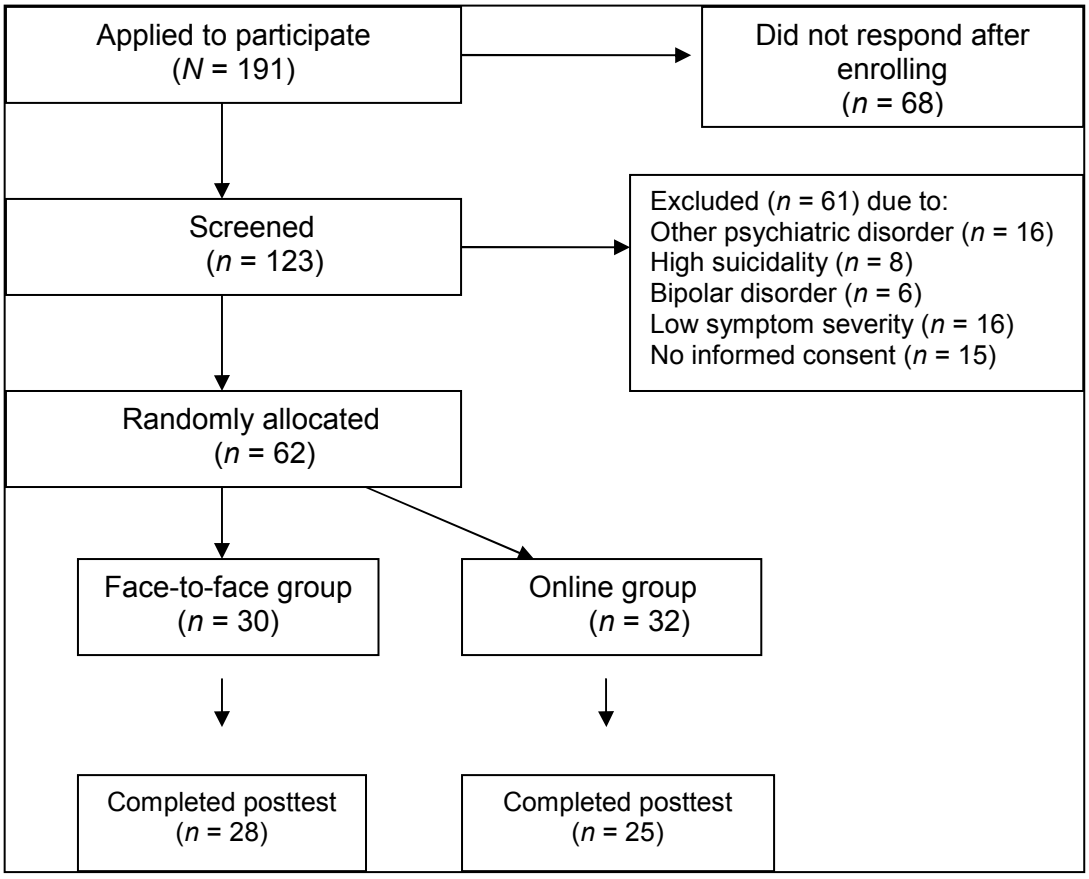

Figure 1. Flowchart of participants

As shown in Figure 1, a total of 191 respondents applied for the treatment. The 62 applicants included in the study were randomized by a true random-number service (http://www.random.org), with 32 participants being randomly allocated to the online group and 30 to the face-to-face treatment

group. Randomization was performed by the study coordinator and was not stratified by any participant characteristics. Seven (22%) participants in the online group and two (7%) participants in the face-to-face group failed to finish the treatment. The main reasons given for discontinuing the treatment were lack of time, sufficient improvement, and lack of motivation. Participants who dropped out of treatment were not considered in the analyses.

Measures

All measures were self-reports administered via an online diagnostic assessment. Fidy [33] found no significant differences between paper-and-pencil and online administration of the German versions of the BDI and the Beck Suicide Ideation Scale (BSIS), which were also used in the present study. Outcome measures were administered at baseline and post-treatment. The working alliance (patients' ratings) was also assessed at mid-treatment after 4 weeks.

Outcome measures

Depression. Depression was assessed with the German version [34] of the Beck Depression Inventory-II (BDI; [32]), which comprises 21 multiple-choice items assessing specific symptoms of depression. The BDI has shown high reliability across diverse populations. The internal consistency in the current sample was $\alpha = .91$.

Working alliance. The quality of the working alliance was assessed by the German version [23] of the Working Alliance Inventory (WAI [35]). Respondents were asked to rate each statement on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*). In this study, both the client and the

therapist version of the 12-item WAI-S [36] were administered at post-treatment. The WAI covers three aspects of the working alliance: bond (degree of mutual trust, acceptance, and confidence between client and therapist; client: α = .84; therapist: α = .84), tasks (agreement on therapeutic tasks; client: α = .88; therapist: α = .77), and goals (agreement on therapeutic goals; client: α = .87; therapist: α = .84). The internal consistencies for the composite scores in our sample were high (client: α = .94, therapist: α = .93).

Exclusion criteria

Applicants were excluded if they met any of the following criteria: currently receiving treatment elsewhere, substance abuse or dependence, on antidepressant medication for less than 4 weeks, age below 18 years, not fluent in German. Further exclusion criteria were high risk of suicide, psychotic symptoms, post-traumatic stress disorder, anxiety, phobia, bipolar disorder, and low depression symptom severity.

Depression. Symptom severity was assessed by the German version of the Beck Depression Inventory [32]. Patients were excluded if their BDI score was below 12.

Suicide ideation. Suicide ideation was assessed with the Beck Suicide Ideation Scale [37], a 21-item inventory developed to measure the intensity and chronicity of suicide ideation in adults. The first 5 items make up a brief subscale measuring the presence of suicidal thoughts, either recently (in the last 6 months) or ever in one's life.

Risk of psychosis. Risk of psychosis was measured using the Dutch Screening Device for Psychotic Disorder [38], a seven-item inventory that is a

good predictor of psychotic episodes. Because no data are yet available from a German norm group, the Dutch norm data were used.

Anxiety. Anxiety was assessed using the Anxiety subscale of the German version of the Symptom Checklist by Derogatis [39]. This 10-item subscale covers various symptoms of anxiety, including cognitive and somatic correlates of anxiety.

Phobia. The German version of the Symptom Checklist by Derogatis [39] was also used to measure phobia. The Phobia subscale contains seven items assessing severity of phobic symptoms.

Post-traumatic stress. The Post-traumatic Stress Scale 10 [40], a short screening instrument tapping DSM-III symptoms of post-traumatic stress disorder including symptoms of hyperarousal, was used to measure symptoms of post-traumatic stress.

Therapists

Six female psychologists and psychotherapists participated in this study. All psychologists were trained in psychotherapy and CBT for depression specifically for this study. The therapists were given special training in therapeutic writing for the online treatment and received regular supervision (face-to-face and online), with therapists in both groups receiving the same amount of supervision. All but one of the therapists were involved in both treatment conditions. Therapists were not randomly allocated to patients.

Treatment

Both treatment conditions were of equal length (8 weeks) and followed an evidence-based short-term CBT treatment manual for depression [29]. This German manual is based on the cognitive theory of depression by Beck and colleagues [34]. The program involved the following modules: introduction, behavioral analysis, planning of activities, daily structure, cognitive restructuring, promotion of social competence, and relapse prevention. A life-review module was added to the standard CBT treatment manual [31]. The aims of life review are to revisit and reattribute past experiences and to activate positive memories and individual resources in order to achieve a balance between positive and negative memories. In the present context, this method was essentially used to activate individual resources (e.g., to identify coping strategies that had helped participants to cope with unresolved past experiences or depressive episodes).

Patients in both groups were given the same psychoeducation and received the treatment modules in the same chronological order. Psychoeducation played an important role in the therapeutic approach. At the beginning of each new treatment module, the patient was informed about the meaning and background of each treatment technique, the significance of the homework set, and the meaning of certain symptoms or reactions.

Patients in the face-to-face condition attended one-hour weekly treatment sessions for 8 weeks with their allocated psychologist in the Department of Psychopathology and Clinical Intervention at the University of Zurich. They were also given weekly homework assignments (e.g., daily structure diaries, negative thoughts log).

For the online condition, the CBT treatment manual for depression [29] was adapted for use as an internet-based intervention, based on the principles applied in a number of previous studies [3, 41-43]. To this end, a highly structured treatment manual was developed. The treatment consisted of structured writing and homework assignments (e.g., behavioral analysis of depressive symptoms, activity diaries, cognitive restructuring worksheets) based on the CBT approach and on the written disclosure procedure developed by Pennebaker and colleagues [3, 44]. Each writing assignment lasted 45 minutes and took place at regular, scheduled times. Within one working day, the therapist provided individual written feedback along with instructions on the next writing assignment. Model responses for the therapists were available, but they also had the option to provide their own commentary or supportive feedback on their patients' texts. Patients were given two writing assignments in each week of the 8-week treatment period. The therapist time involved in responding to texts ranged from 20 to 50 minutes per text, depending on the therapist's experience with internet-based therapies.

Data analysis

SPSS 17.0 for Windows was used for all analyses. In preliminary analyses, we compared the online and face-to-face group at baseline using *t* and chi-square tests. *T* tests were then used to compare the therapeutic alliance in the two intervention groups. In addition, bivariate and partial correlations (Pearson) were calculated to examine the relationship between the working alliance and therapy outcome.

Treatment outcome was assessed as (a) the BDI score at post-treatment (BDI-post) and (b) the BDI residual gain score (the difference between the z-transformed BDI scores at post-treatment and baseline multiplied by the correlation between the two scores [45].The therapeutic alliance was assessed in terms of the composite score on the WAI and the scores on the three subscales (bond, tasks, goals) of the clients' (WAI-C) and the therapists' (WAI-T) ratings.

To quantify the magnitude of differences between the two groups (online versus face-to-face), we used Cohen's *d* as a measure of effect size. Cohen [46] distinguished between small (*d* = .20), medium (*d* = .50) and large (*d* = .80) effect sizes.

Since we did at no time obtain data concerning therapeutic alliance from drop outs we could not conduct intention-to-treat analysis.

Results

Quality of the working alliance in the treatment groups

Table 2 shows the means, standard deviations, *p* values (*t* tests), and effect sizes for the quality of the working alliance in the online and the face-to-face group. Patients and therapists were asked to evaluate the quality of the working alliance at post-treatment; patients additionally completed the Working Alliance Inventory at mid-treatment after 4 weeks. Ratings were given on a scale from 1 to 7, with high values indicating a strong therapeutic alliance. As shown in Table 2, in the online condition, the clients' post-treatment ratings (WAI-C) tended to be slightly higher than the therapists' post-treatment ratings (WAI-T). Further, the subscale and composite scores

of both the WAI-C and the WAI-T were all slightly higher in the online condition than in the face-to-face condition. However, with the exception of the WAI-T tasks score, which was significantly higher in the online condition ($p < 0.05$), the differences between the online and the face-to-face groups were not significant.

Working alliance and therapy outcome

Table 3 shows the correlations of the WAI scores at mid- and post-treatment with the BDI score at post-treatment and the BDI residual gain score. Significant correlations were found between therapy outcome and clients' ratings of the working alliance in the online group (tasks subscale) at post-treatment and in the face-to-face group at mid- (tasks subscale and composite score) and post-treatment (tasks, goals, and composite scores). The BDI baseline score was included in the analysis as a control variable. Further, analysis of the relations between the BDI residual gain score and the WAI scores revealed that the working alliance ratings did not significantly predict the BDI residual gain score in either group at mid- or post-treatment.

Table 2: Working alliance in the two intervention groups: means, standard deviations, t test comparisons, and effect sizes.

	Sample means								
	Online (*N* = 25)			Face-to-Face (*N* = 28)					
Scales	*M*	*SD*	*n*	*M*	*SD*	*n*	*Test statistic*	*p*	*d*
WAI-C mid-treatment									
Tasks	5.82	.80	25	5.48	1.05	28	1.30 [4]	.19	0.36
Bond	5.68	.99	25	5.39	1.01	28	1.04[5]	.30	0.29
Goals	5.95	.81	25	5.81	1.01	28	.54[5]	.59	0.15
Composite	5.82	.78	25	5.56	.91	28	1.08[5]	.28	0.31
WAI-C post-treatment									
Tasks	6.17	.80	25	5.66	1.18	27	1.81[1]	.07	0.51
Bond	5.91	.97	25	5.67	.95	28	.91[4]	.36	0.25
Goals	6.22	.79	25	5.98	1.01	28	.94[5]	.35	0.26
Composite	6.10	.77	25	5.76	.98	27	1.39[3]	.16	0.39
WAI-T post-treatment									
Tasks	6.16	.60	25	5.66	.89	28	2.36[2]	.02*	0.66
Bond	5.86	.90	25	5.79	1.14	28	.26[5]	.79	0.07
Goals	6.11	.71	25	5.98	1.00	28	.53[3]	.59	0.15
Composite	6.04	.67	25	5.80	.96	28	1.01[3]	.31	0.29

Note. WAI-C = Working Alliance Inventory – Clients' ratings; WAI-T = Working Alliance Inventory – Therapists' ratings; [1] df = 46, [2] df = 47, [3] df = 48, [4] df = 49, [5] df = 50.

* $p < .05$.

Table 3: Correlations of the WAI scores with the BDI score at post-treatment and the BDI residual gain score in the online and face-to-face groups.

Variable	BDI-post (covariate: BDI-pre)		BDI residual gain score	
	Online	Face-to-face	Online	Face-to-face
WAI-C mid-treatment				
Tasks	-.16	-.52**	-.15	-.35
Bond	-.04	-.21	.12	-.08
Goals	-.09	-.32	-.16	-.22
Composite	-.10	-.40*	-.06	-.24
WAI-C post-treatment				
Tasks	-.47*	-.46*-.	-.33	-.33
Bond	-.15	-.27	.08	-.22
Goals	-.36	-.43*	-.33	-.33
Composite	-.35	-.42*	-.20	-.32
WAI-T post-treatment				
Tasks	-.25	-.29	-.12	-.16
Bond	-.07	-.20	.16	-.15
Goals	-.24	-.22	-.11	-.13
Composite	-.20	-.24	-.01	-.14

Note. WAI-C = Working Alliance Inventory – Clients' ratings; WAI-T = Working Alliance Inventory – Therapists' ratings; BDI = Beck Depression Inventory.

* $p < .05$. ** $p < .01$.

Discussion

The aim of this study was to investigate the quality of the therapeutic alliance between patient and therapist in an online and face-to-face CBT for depression. To our knowledge, this was the first randomized controlled trial in this context. First, we examined whether the therapeutic alliance was comparable in both groups. Our results showed that the online and the face-to-face group differed significantly in only one subscale: therapists' ratings of the tasks subscale were significantly higher in the online group. This finding is in line with previous studies reporting that a strong working alliance, comparable to that formed in face-to-face settings, can also be established in online settings. The WAI mean scores in our study ranged from 5.39 to 6.22 (of a maximum of 7). These findings are comparable to data presented by Knaevelsrud and Maercker [22], who reported mean scores ranging from 5.6 to 6.4 in Table 3 of their article. Furthermore, authors using other scales or other versions of the WAI have also provided evidence for a comparably strong working alliance in online settings as in face-to-face therapy. Cook and Doyle [18], for example, reported results for an online sample to be comparable with normative data from a representative sample in face-to-face therapy. Most of the participants in their sample presented with relationship issues, depression, anxiety, or grief. However, because of the small sample size and the non-randomized allocation of patients, these preliminary results should be interpreted with caution. In the same vein, Reynolds and colleagues [20] reported ratings of the therapeutic alliance in an online setting to be similar to existing data from a face-to-face group. The participants in their study presented with depression, stress, anxiety, or childhood abuse. We were able to replicate the findings from both of these

studies in a randomized controlled setting with a sample of depressive adults. The higher therapist ratings of the tasks subscale in the online group in our study may be attributable to the clear presentation and structuring of the tasks in the online mode, and to the opportunity to focus carefully on elaborated tasks. This fact may have positively influenced the agreement between clients and therapists on the therapeutic tasks.

Further, the drop-out rate in our study was relatively low. Seven (22%) participants in the online group and two (7%) participants in the face-to-face group discontinued the treatment. In general, drop-out rates in internet-based interventions are known to be problematic [5]. However, the drop-out rates reported for studies involving internet-based interventions for depression over the last five years differ widely. For instance, Titov and colleagues [47] reported that 11% of participants in a clinician-assisted internet-delivered CBT for depression did not complete post treatment questionnaires. In contrast, Spek and colleagues [48] reported a drop-out rate of 66% for the intervention group of an internet-based CBT intervention study for subthreshold depression (individuals who did not complete post-test, did not start the intervention, or withdrew). In our sample, the attrition rates in the online group (22%) versus the face-to face group (7%) differed significantly, $\chi^2(1) = 4.737$, $p < .05$. This may indicate that the more anonymous online therapeutic relationship is less stable than the face-to-face relationship. It is easier for patients in online treatment settings to stop therapeutic communication by simply “disappearing.” A study of online romantic relationships revealed that avoidance behavior and discontinuity are more likely in online relationships than in face-to face relationships [49].

Furthermore, we were interested in whether the therapeutic alliance predicted depression as outcome in the online or the face-to-face group. In both groups, only the clients' ratings of the working alliance were associated with depression at post-treatment (specifically, the composite score and tasks subscale in the face-to-face group at mid-treatment and, at post-treatment, the tasks subscale in the online group and the composite score and the tasks and goals subscales in the face-to-face group). It is worth noting that the correlations reported here are statistically significant, but only moderately high, ranging from r = -.42 to r = .52. These results are in line with findings on face-to-face psychotherapy. In a review article, Martin and colleagues [50] reported a moderate but consistent relationship between the therapeutic alliance and outcomes of face-to-face psychotherapy. However, in the online group, only the working alliance at post-treatment was significantly associated with depression at post-treatment. This result replicates the findings of Knaevelsrud and Maercker [23],who found no significant relationship between the working alliance at mid-treatment and PTSD change scores. Further, our data showed no significant relations between the BDI residual gain score and the working alliance in either group at mid- or post-treatment. Knaevelsrud and Maercker [22] discussed the importance of investigating the working alliance at several stages of the therapeutic process to elucidate the relationship between working alliance and outcome. The authors suggested that the working alliance might be more an "additional indirect measure of outcome" than a predictor of treatment outcome.

The limitations of our study include the assessment of the working alliance and depression. As participants were first contacted online and later

allocated at random to the online or the face-to-face group, all measures were administered as self-rated questionnaires in an online setting. Although this procedure has proven valid and reliable in various previous studies [18, 20, 22-25], a structured clinical interview would have allowed a better quality of diagnosis of depression and the therapeutic relationship.

A further limitation is that we are unable to present follow-up data at the present time. Collection of follow-up data (after 3, 6 and 12 months) is still ongoing. Therefore, it remains an open question whether the working alliance at post-treatment predicts outcomes at follow-up.

Furthermore, the sample used in this study was small, relatively well educated and more than half of the participants already had experience of psychotherapy. Future studies should enroll larger and more heterogeneous samples. Another limitation of the study is the generalizability of our results. Due to our strict exclusion criteria regarding co-morbidity, suicide ideation, and psychosis, a number of applicants were excluded from the study. Our findings may therefore not be comparable with more naturalistic designs. Further research is needed to focus specifically on patients with co-morbidities.

Conclusions

In conclusion, an internet-based intervention has the potential to facilitate a working alliance that is comparable to that formed in face-to-face settings, though not as influential with respect to symptom reduction. This is the first randomized controlled trial to evaluate the therapeutic alliance between patient and therapist in online and face-to-face treatment settings for depression in an experimental design. Our study contributes to a better

understanding of the working alliance in internet-supported therapeutic interventions, replicating previous findings [18, 20, 22-25] showing that a strong working alliance can be established in an online setting, comparable to that established in face-to-face settings.

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Paper 3: Life-review intervention with computer supplements for depression in the elderly: A randomized controlled trial

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Abstract

Objectives

Life-review intervention has been recognized as an effective therapeutic approach for depression in older adults. Additionally, the use of new media is becoming increasingly common in psychological interventions. The aim of this study was to investigate a life-review intervention in a face-to-face setting with additional computer use.

Method

This study explored whether a six-week life-review intervention with computer supplements from the e-mental health Butler system constitutes an effective approach to treat depression in older adults aged 65 and over. A total of 36 participants were randomized to a treatment group or a waiting-list control group and completed the post-assessment. 14 individuals in the intervention group completed the follow-up assessment.

Results

Analyses revealed significant changes from pre- to post-treatment or follow-up for depression, well-being, self-esteem and obsessive reminiscence, but not for integrative reminiscence and life-satisfaction. Depressive symptoms decreased significantly over time until the 3-month follow-up in the intervention group compared to the control group (pre to post: d = 1.13; pre to follow-up: d= 1.27; group x time effect pre to post: d = 0.72). Furthermore, the intervention led to an increase in well-being and a decrease in obsessive reminiscence among the participants in the intervention group from pre-treatment to follow-up (well-being: d = .70; obsessive reminiscence: d = .93). Analyses further revealed a significant but small group x time effect regarding self-esteem (d = .19).

Conclusion

By and large, the results indicate that the life-review intervention in this combined setting could be recommended for depressive older adults.

Keywords: depression, life-review, e-mental health, older adults

Introduction

Since depression is among the most frequent mental disorders in old age (prevalence rate 26.8%, Berlin Aging Study (Wernicke, Linden, Gilberg, & Helmchen, 2000)), the development of new psychotherapeutic treatment methods or the adaptation of existing ones is highly relevant. The importance of focusing especially on milder forms of depression in this context arises due to the fact that older adults show a different symptomatology of depression than younger adults. In old age, the prevalence rates for milder forms or subthreshold depression are higher than for major depressive disorder (Cole & Dendukuri, 2003; Wernicke, et al., 2000), while subthreshold depression is considered as a risk factor for developing a major depressive disorder (Beekman, et al., 2002).

In the current study, a life-review intervention with computer supplements for milder forms of depression in the elderly was investigated. The intervention consisted of several modules: a face-to-face life review part focusing on positive and negative past events; and a computer part (see below: “Butler” system, Botella, et al., 2009) focusing exclusively on positive experiences. In general, life-review intervention has been recognized as an effective treatment for depression in older adults (Bohlmeijer, Smit, & Cuijpers, 2003) and has been defined as a structured, time-limited and evaluative intervention focusing on the whole life-span, i.e. a systematic review from early childhood until old age (Haight & Haight, 2007; Pinquart & Forstmeier, 2012). Life-review intervention focuses on the balance of positive and negative reminiscence, the redefinition of negative experiences and elaboration of memory (Maercker, 2002). Through structured questions, life-review intervention enables the individual to focus equally on positive and

negative past events, with the aim of obtaining a coherent and balanced view of one's past life. Traditionally, different styles of reminiscence have been distinguished (Webster, 1993). Wong & Watt (1991) showed that some reminiscence styles are more strongly related to successful aging than others, e.g., the integrative style, i.e. an achievement of a "sense of self-worth, coherence, and reconciliation with regard to one's past" (p.273) being positively related to well-being. Based on these findings, we aimed to investigate two different reminiscence styles, integrative and obsessive reminiscence; the latter being related to less successful aging as compared to integrative reminiscence, which was associated with successful aging in the study by Wong & Watt (1991).

In a meta-analysis regarding the effectiveness of life review on late-life depression, Bohlmeijer et al. (2003) reported a large effect size (d = 0.84). Moreover, in a recent randomized controlled trial (intervention: life-review, control: movie), Pot et al. (2010) showed that a life-review course was an effective method to reduce depressive symptoms in adults aged 50 or over. Furthermore, Serrano, Latorre, Gatz, & Montanes (2004) showed in a randomized controlled trial that the integration of "autobiographical retrieval practice" into life review, focusing only on positive events, proved to be an effective intervention tool for depressive older adults aged 65 or over. Based on these findings, a module was integrated into the current study focusing on positive events in a computer-guided setting (see below).

Besides depressive symptoms, life review intervention has also shown positive effects on self-esteem. Chiang, Lu, Chu, Chang, & Chou (2008) showed in a randomized controlled trial that a "Life-Review Group Program" (LRGP) positively influenced the self-esteem of elderly males (mean age

78.13 years). In an earlier study, Haight & Dias (1992) investigated the effects of ten different forms of reminiscence on depression and self-esteem. Results showed that a structured and evaluative form of life review is more effective than other forms with regard to depression and self-esteem.

Furthermore, life-review intervention has shown positive effects on satisfaction with life and/or well-being (Bohlmeijer, Roemer, Cuijpers, & Smit, 2007; Chiang, et al., 2008). Based on these findings, in the current study, we further investigated the effects of our intervention on life satisfaction and well-being.

As mentioned above, the life-review intervention conducted in the current study also contained a computer intervention part, comprising two 'depression modules' of a computer program ("Butler" system, Botella, et al., 2009) (as detailed below). In general, e-health interventions targeting older adults have been recognized as a promising approach for a variety of domains including depression, although research in this field is still in its infancy (Preschl, Wagner, Forstmeier, & Maercker, 2011). Moreover, therapeutic software has been used successfully as a supplement in traditional face-to-face therapy, e.g. "Virtual Reality Exposure Therapy" (Parsons & Rizzo, 2008), in which a computer tool (a simulation or virtual environment) can be used in a therapeutic setting for the treatment of anxiety and specific phobias. With regard to depression (and anxiety), a computer program containing several modules was developed by a Spanish research team, the so-called "Butler system" (Spanish: "Mayordomo") (Botella, et al., 2009). This system provides various fields of application for older adults: diagnosis and therapy (depression and anxiety) and social interaction modules (also for healthy older adults). In the current study, two therapy

modules of this system for treating depression were used, which provide the possibility to focus on certain events in the context of life review and autobiographical memory. The first module contains so-called “Virtual Environments” (VE), in which the user learns techniques to reduce negative mood and to recall and describe positive autobiographical memories. The second module, a 3D adaptation of a book containing several chapters, is called the “Book of Life”. By incorporating text, pictures, and Mp3 music files, the “Book of Life” can be customized by the user. The “Butler system” contains touch screen technology and was developed and tested to meet the needs of older adults (Botella, et al., 2009). All applications are guided by a personalized icon, the so-called “butler”, or in the case of the VE by a female voice, which describes all exercises to the user step by step. The “Butler system” was translated into German at the University of Zurich in cooperation with the aforementioned Spanish team, who integrated the German audio and text files into the system. The methods section of this article provides more information about how the depression modules of the “Butler system” were used in the current study.

Based on these findings, we conducted a randomized controlled study investigating a structured and time-limited (six-week) life-review intervention with depressive older adults in a face-to-face setting with additional use of the aforementioned depression modules of the “Butler system” (Botella, et al., 2009). To our knowledge, this is the first randomized controlled trial to investigate a life-review intervention in a combined e-mental health setting. The first objective of this study was to investigate whether this combined and short-term life-review intervention leads to a reduction in depressive symptoms. Second, we examined whether the intervention leads to an

increase in self-esteem, life satisfaction and well-being. Third, we investigated two styles of reminiscence: integrative and obsessive reminiscence.

Methods

Study design

A randomized controlled trial comparing a face-to-face life-review intervention including computer supplements with a waiting-list control group was conducted at the University of Zurich. Both groups received a six-week intervention; for ethical reasons, the waiting-list control group received the same intervention after the waiting time period. Assessments were conducted at baseline and at post-treatment, and participants in the intervention group also participated in a 3-month follow-up session. The participants completed the Beck Depression Inventory (BDI-II, Hautzinger, Keller, & Kühner (2006), the Rosenberg Self-Esteem Scale (SES, (Wendt, 1979), the Life Satisfaction Index - A (LSIA, (Wiendieck, 1970)), the Reminiscence Questionnaire (RQ, Mayer, Filipp, & Ferring, 1996b), and the WHO-Five Well-being Index (WHO-5, Bech, 1998).

Participants

Participants were recruited between December 2009 and April 2011. The ethics committee of the German Psychological Society (DGPs) approved the study in December 2009. Patients were recruited through advertisements in newspapers, supermarkets, libraries, pharmacies, general practitioners'

practices, a contact list of individuals who were generally interested in participating in research projects, and lectures for older adults at the University of Zurich.

Older adults aged 65 or over who suffered from minimal (subsyndromal) to moderate depression (BDI-II score >9) were included in the study. Exclusion criteria were cognitive impairment (MMSE, Folstein, Folstein, & McHugh (1975) score below 27), severe depression (BDI-II score above 28, SKID, (Wittchen, Zaudig, & Fydrich, 1997)), severe vision or hearing impairment (NAB, Oswald & Fleischmann, 1995), mobility problems (unable to come to the outpatient clinic), currently receiving psychotherapeutic treatment elsewhere (during the treatment or waiting time period, but also between post-assessment and follow-up), indications of severe suicidal ideation (BDI-II, SKID), or other psychiatric disorders (SKID).

Demographic characteristics of the sample are presented in Table 1. No significant differences in baseline characteristics were noted between groups, besides age [$\chi^2(1) = 5.36$, $p < .05$]. The scores of the outcome measures of the two groups did not differ significantly at baseline, with the exception of life satisfaction (LSIA) [$t(34) = -2.18$, $p < .05$].

Table 1: Sample characteristics.

Characteristics	Total sample (n =36)	Intervention group (n =20)	Control group (n =16)	Group comparison (df)
Age, Median (SD) (in years)	70.0 (4.4)	72.5 (4.5)	67.0 (3.1)	$\chi^2(1) = 5.36, p < .05$
Gender (female)	24.0 (66.7%)	15.0 (75 %)	9.0 (56.3 %)	$\chi^2(1) = .25$, ns
Marital status				$\chi^2(3) = .7$, ns
Married/cohabiting	19.0 (52.8%)	9.0 (45 %)	10.0 (62.5%)	
Divorced	9.0 (25 %)	7.0 (35 %)	2.0 (12.5 %)	
Widowed	8.0 (22.2 %)	4.0 (20 %)	4.0 (25 %)	
Educational level				$\chi^2(5) = .44$, ns
low	11.0 (30.5%)	8.0 (40 %)	3.0 (18.8 %)	
medium	17.0 (47.2%)	9.0 (45 %)	8.0 (50.1 %)	
high	8.0 (22.3 %)	3.0 (15 %)	5.0 (31.1 %)	
Employment status				
Retired	36.0 (100 %)	20.0 (100 %)	16.0 (100 %)	
No antidepressants	25.0 (65.8%)	15.0 (71.4 %)	10.0 (58.8%)	$\chi^2(1) = .42$, ns
Previous psychotherapy	11 (31.4 %)	6 (31.6 %)	5 (31.3 %)	$\chi^2(2) = .54$, ns
Depression (BDI-II) score at baseline M (SD)	17.6 (6.3)	19.0 (6.6)	16.5 (5.6)	t(38) = .20, n.s.
Self-esteem (SES) score at baseline M (SD)	22.1 (4.8)	21.4 (5.4)	23.0 (3.9)	t(34) = .33, n.s.
Well-being (WHO-5) score at baseline M (SD)	12.1 (6.0)	10.5 (5.8)	14.1 (5.9)	t(34) = -1.84, n.s.
Life satisfaction (LSIA) score at baseline M (SD)	32.5 (3.8)	31.4 (3.5)	34.0 (3.8)	t(34) = -2.18, p < .05
Integrative Reminiscence (RQ) score at baseline M(SD)	9.9 (1.9)	9.8 (1.5)	10.2 (2.3)	t(34) = -.62, n.s.
Obsessive Reminiscence (RQ) score at baseline M(SD)	10.3 (3.2)	10.3 (2.9)	9.8 (3.6)	t(34) = .72, n.s.

Note. BDI-II = Beck Depression Inventory, SES = Rosenberg Self-Esteem Scale, WHO-5 = WHO-Five Well-being Index, LSIA = Life Satisfaction Index, RQ = Reminiscence Questionnaire.

Study Procedure

Participants indicated their interest in the study by contacting the study coordinator via telephone or E-Mail. In this context, the study coordinator asked about basic characteristics (age, mobility, currently receiving psychotherapy) and provided general information concerning the procedure of the study and depressive symptoms. Subsequently, a meeting was arranged to give further information and check for inclusion and exclusion criteria. If the inclusion criteria were met, participants were randomly assigned to either the intervention group or a waiting-list control group at the end of the first meeting. The study coordinator used a true random number service (http://www.random.org) to organize the randomization procedure, which was not stratified by any participant characteristics. All participants were provided with detailed information regarding their participation in the intervention or control group. They were further informed about potential risks and benefits of study participation and told that they could withdraw from the study at any time. All information was provided in oral and written form. In addition, participants signed an informed consent form. One week after the first meeting, the second meeting was arranged to assess the baseline data. Participants were encouraged to telephone or e-mail the therapist during their study participation in the case of distress or crisis. Applicants excluded from the study were informed about other available forms of counseling or treatment. Participants in the intervention group began with the six-week intervention one week after the baseline assessment. For ethical reasons, the control group also received the same therapy after a six-week waiting time period.

Figure 1 shows a flow chart of participants. Twenty individuals in the

intervention group and sixteen in the control group completed the post measurement. Furthermore, fourteen participants in the intervention group completed the follow-up. After beginning treatment, nobody dropped out before finishing the post-measurement, but six failed to complete the three-month follow-up. The main reasons given for discontinuing participation were lack of time, lack of motivation, transportation problems, or severe illness. Participants who dropped out before starting treatment or finishing baseline assessments were not considered in the analyses.

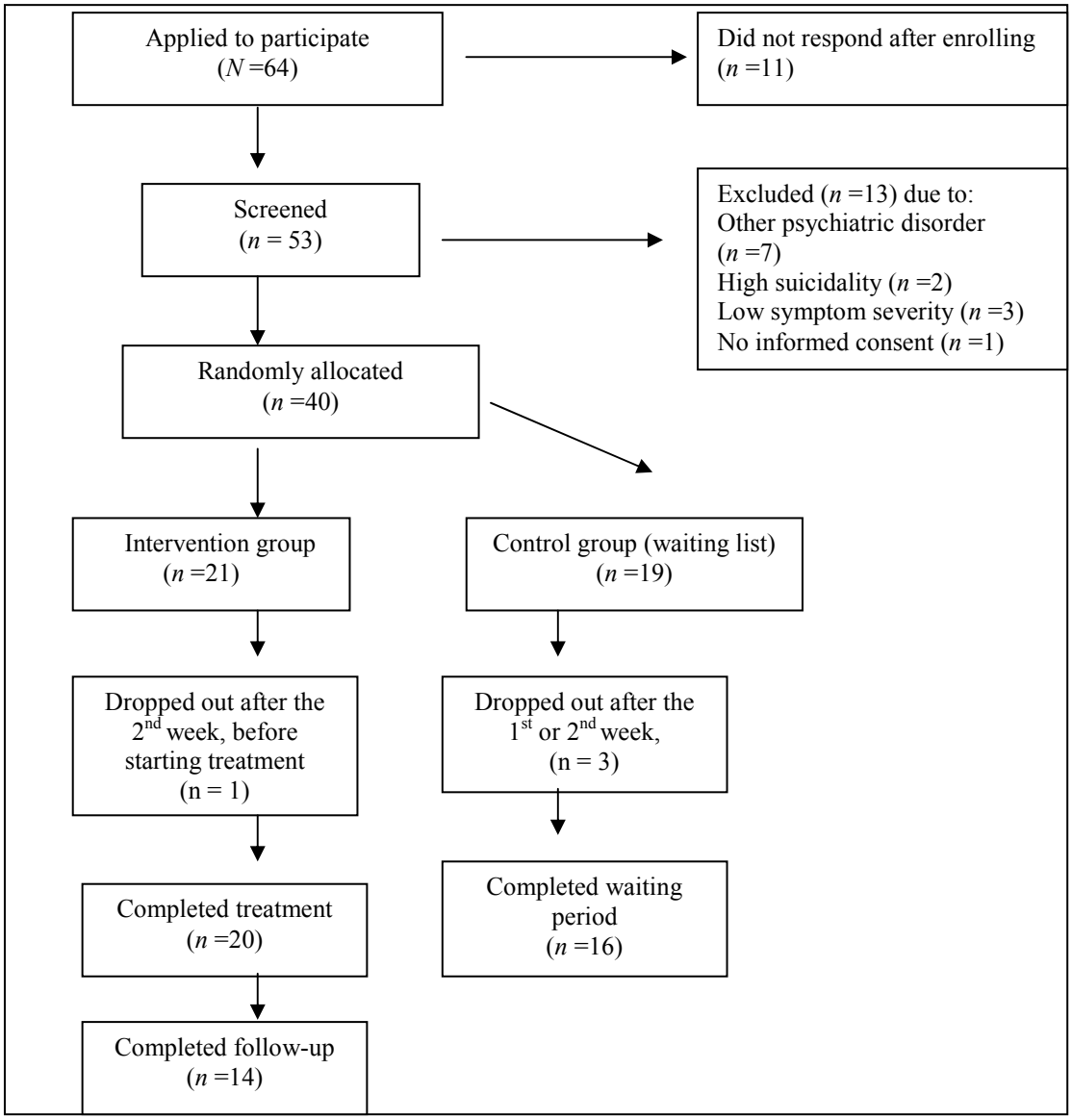

Figure 1: Flowchart of participant progress.

Measures

Outcome measures

Depression. Depression was measured using the German version (M. Hautzinger, et al., 2006) of the Beck Depression Inventory-II (BDI, Beck, Steer, & Brown, 1996), a self-rating questionnaire with 21 items assessing specific symptoms of depression. The internal consistency in the current sample was α = .86.

Self-esteem. Self-esteem (positive and negative attitudes towards oneself) was assessed using the Rosenberg Self-Esteem Scale (RSES, Wendt, 1979). The internal consistency in the current sample was α = .70.

Life Satisfaction. To assess life satisfaction, the Life Satisfaction Index A (LSIA, Wiendieck, 1970) was used. The LSIA is an 18-item self-report scale to measure life satisfaction especially in old age. The internal consistency in the current sample was α = .76.

Well-being. Well-being was measured using the WHO-Five Well-being Index (WHO-5, Bech, 1998), a five-item questionnaire. The internal consistency in the current sample was α = .89.

Reminiscence Frequency. In the current study, integrative (3 items) and obsessive reminiscence (4 items) was assessed using the Reminiscence Questionnaire (RQ, Mayer, Filipp, & Ferring, 1996a), a German questionnaire that was developed in the style of the Reminiscence Function Scale (RFS, Webster, 1993). The internal consistency in the current sample was α = .64 for integrative reminiscence, and α = .72 for obsessive reminiscence.

Exclusion criteria

Cognitive impairment / dementia. Cognitive functioning was assessed by the Mini Mental State Examination (MMSE, Folstein, et al., 1975). Individuals who scored below 27 were excluded.

Suicidal ideation. Severe suicidal ideation was screened with the BDI-II and the Structured Clinical Interview for DSM-IV (SKID, Wittchen, et al., 1997) . Individuals who were excluded due to severe suicidal ideation were provided with support in addition to the general information for excluded individuals, e.g. informing significant others or other professionals (e.g. their general practitioner).

Other psychiatric disorders. To screen for other psychiatric disorders, we used the SKID (Wittchen, et al., 1997). Diagnoses were validated by experienced clinicians who were trained in structured clinical assessment.

V*ision and hearing.* Vision and hearing impairment was assessed using items 8 and 10 of the "Nuremberg Gerentopsychological Observation Scale" (NAB), an observer-rated subscale of the Nuremberg Gerentopsychological Inventory (NAI, Oswald & Fleischmann, 1995). A score below 3 was considered as meeting the inclusion criteria.

Therapists

One male and one female psychologist with training in psychotherapy and cognitive behavioral therapy (CBT) participated in this study. Both therapists were given special training in life-review intervention and in the application of the computer modules for this study and received regular supervision. Therapists were allocated to patients based on time and availability.

Treatment

In the context of the current study, a structured treatment manual was compiled following Haight & Haight (2007), Maercker (2002) and Serrano et al. (2004). In total, eight meetings were arranged with each participant. During the first two meetings (one meeting each in the first and second week), the participants answered questionnaires screening for inclusion criteria and answered the baseline assessment. In the third week, the intervention group began the treatment, meeting for one session per week for six weeks. Each session was divided into two parts: a face-to-face part (about two thirds of the session time) and a computer part (about one third of the session time). Each session lasted between 1 and 1.5 hours. In the first session, the patient was provided with a list of questions focusing on negative and positive experiences of his or her past life from childhood until old age. The questions were treated as suggestions; if the patient wished to add or delete something he or she was free to do so. Furthermore, the therapist was free to adapt and extend the questions based on the individual information the patient provided. The therapist could, for example, ask about current or past hobbies in two different ways based on the provided information. If the information suggested that a hobby might be a resource, i.e. a positive experience, one could ask: “I would like to invite you to tell me more about your hobby hiking! You told me it used to be fun to go hiking with your family?” If the information provided indicated that a hobby could probably no longer be carried out (e.g. due to loss of physical health), the therapist could rephrase: “I would invite you to tell me more about the challenges that you are currently facing. You told me that you are no longer able to go hiking? What happened and what does this mean to you?”.

Moreover, each patient was encouraged to think in each session about one especially positive event that could be worked with in the computer part. In the face-to-face part, the patient and the therapist focused on both negative and positive experiences, situations and memories in the biographical past, with the particular aim of restructuring negative ones. In the additional computer part, the patient was encouraged to filter positive experiences and to describe them in detail. Therefore, two depression modules of the "Butler system" (Botella, et al., 2009) were introduced. During the exercises in the "Virtual environment" module, the patient was encouraged to recall in detail a positive event and to carry out further exercises to induce positive mood. The therapist sat next to the patient and provided support in particular by finding positive events, which was often difficult for depressive patients. In the so called "Book of Life" module, the patient was encouraged to write down this positive situation and could add photos and music if desired. At the end of the final session, all participants received a printed version of their text and photographs of the Book of Life that they had developed together with the therapist during their participation. They where encouraged to further adopt the developed strategies to reduce negative mood, to restructure negative thoughts, or to focus on positive events in their lives and to talk to significant others about their emotions.

Data analysis

SPSS 17.0 for Windows was used for all analyses. In preliminary analyses, we compared the intervention and the control group at baseline using *t* and chi-square tests.

To test hypothesis 1, analysis of covariance (ANCOVA) for repeated measures was carried out including a between-group factor (intervention vs. control group) and a within-group factor (pre-treatment vs. post-treatment). The main focus was basically on the group x time interaction effect. Further, mean scores at follow-up (after 3 months) were compared with pre-treatment mean scores (ANOVA). In addition, partial correlations (Pearson) were calculated to examine the relationship between the depression residual gain scores and the investigated variables.

As no participants dropped out after beginning the intervention, we did not conduct intention-to-treat analysis.

Results

Since a preliminary analysis of the sample characteristics revealed significant age differences between the two groups, we controlled for age in the following analysis. A dichotomous age variable was calculated by creating two groups of younger and older participants using median split (70 years).

We hypothesized that the life-review intervention might lead to a reduction in depressive symptoms and an increase in self-esteem, life satisfaction, well-being and integrative reminiscence, as well as a decrease in obsessive reminiscence. As shown in Table 2, results from the ANCOVA revealed a significant group (intervention vs. control group) x time (pre-treatment vs. post-treatment) interaction effect for depression (BDI-II, F 11.46, $p < .01$, $d = 0.72$), indicating that the decrease in depressive symptoms in the intervention group was significantly larger than in the control group. Analysis did not reveal significant effects of age as control variable (F

.95, $p > .05$). Further, the depression score decreased significantly in the intervention group from pre-treatment to post-treatment compared to the control group (F 4.49, $p < .05$) and from pre-treatment to the 3-month follow-up (F 18.21, $p < .01$). Results indicate a large effect size from pre- to post-treatment ($d = 1.13$) and from pre-treatment to follow-up ($d = 1.27$). Figure 1 shows the course of depressive symptoms by group over time.

Further, Table 2 shows results from the ANCOVA concerning self-esteem (SES). The analysis revealed a significant but smaller group x time effect (F 4.21, $p < .05$) compared to depression and did not reveal significant effects of age as control variable (F .34, $p > .05$). The effect in this case was small ($d = .19$) and self-esteem was not found to increase significantly between pre-treatment and follow-up (F .19, $p > .05$) but decreased to the baseline level. Moreover, results showed no significant effect of factor from pre-treatment to post-treatment (F .29, $p > .05$).

Results from the ANCOVA concerning well-being (WHO-5) showed no significant effect of factor from pre- to post-treatment (F .01, $p > .05$), and no significant interaction effect (F 2.69, $p > .05$), but a significant effect in the intervention group from pre- to 3-month follow-up (F 5.39, $p < .05$, $d = .70$). Similarly, the obsessive reminiscence (RQ) did not decrease significantly from pre- to post-treatment in the intervention group compared to the control group (F 2.24, $p > .05$), and nor was the interaction effect significant (F .00, $p > .05$). However, the obsessive reminiscence (RQ) decreased significantly in the intervention group from pre-treatment to the 3-month follow-up (F 7.43, $p < .05$, $d = .93$). Results concerning integrative reminiscence (RQ) did not show any significant effect of factor (F .09, $p > .05$), interaction at post-

treatment (F 2.69, $p > .05$) or from pre-treatment to follow-up (F 4.61, $p > .05$).

With regard to life satisfaction (LSIA), the results showed a significant effect of factor (F 6.52, $p < .05$, $d = .58$), indicating that the life satisfaction decreased significantly in the control group. Furthermore, results did not indicate a significant interaction effect (F 1.10, $p > .05$), but analyses revealed a significant age influence (F 4.8, $p < .05$). Results did not show a significant effect from pre-treatment to follow-up (F .37, $p > .05$).

Table 3 shows the correlations between the depression residual gain score (BDI-II) and self-esteem (SES), well-being (WHO-5), life satisfaction (LSIA), integrative reminiscence (RQ) and obsessive reminiscence (RQ). The depression residual gain score was calculated as the difference between the z-transformed BDI scores at post-treatment and baseline multiplied by the correlation between the two scores (Heinecke, Weise, & Rief, 2010). Significant medium correlations were found between self-esteem (SES) and the depression residual gain score (BDI-II) at post-treatment ($r = .70$, $p < .01$), between the integrative reminiscence score (RQ) and the depression residual gain score (BDI-II) at post-treatment ($r = -.48$, $p < .05$), between the obsessive reminiscence score (RQ) and the depression residual gain score (BDI-II) at pre-treatment ($r = -.55$, $p < .05$), and further, between the well-being score (WHO-5) and the depression residual gain score (BDI-II) at the 3-month follow-up ($r = -.57$, $p < .05$).

Table 2: Means, standard deviations and effect sizes for depression and self-esteem by treatment and control group.

					Group x pre-post effect		
	Pre-test	Post-test	Follow-up	Effect size pre to post	F	*p*	Effect size pre to 3-month follow-up
Depression-BDI-II							
Treatment	19.0 (6.6)	10.0 (6.3)	8.7 (4.8)	1.13 [a]	11.46	< .01	1.27 [a]
Control	16.5 (5.6)	15.1 (7.8)	-	.26			-
Self-esteem -SES							
Treatment	21.4 (5.4)	22.4 (4.1)	21.4 (4.4)	.29	4.21	< .05	0
Control	23 (3.9)	21.6 (4.4)	-	.49			-
Well-being WHO-5							
Treatment	10.5 (5.8)	14.5 (4.5)	14.6 (4.0)	.51	2.69	>.05	.70 [a]
Control	14.1 (5.9)	13.1 (5.9)	-	.15			-
Life satisfaction LSIA							
Treatment	31.4 (3.5)	31.6 (3.8)	31.4 (3.0)	0	1.11	>.05	0
Control	34.0 (3.8)	32.6 (3.42)	-	.58 [a]			-

Integrative Rem. (RQ)							
Treatment	9.8 (1.5)	10.3 (1.5)	10.6 (1.9)	.23	2.69	>.05	.53
Control	10.2 (2.3)	9.4 (2.9)	-				-
Obsessive Rem. (RQ)							
Treatment	10.6 (2.9)	10.0 (1.7)	8.6 (2.8)	.31	.00	>.05	.93 [a]
Control	9.8 (3.6)	9.8 (3.6)	-	0			-

Note. Treatment group: n = 20 (n = 14 at follow-up), control group: n = 16, [a] significant effect; BDI-II = Beck Depression Inventory, SES = Rosenberg Self-Esteem Scale, WHO-5 = WHO-Five Well-being Index, LSIA = Life Satisfaction Index, RQ = Reminiscence Questionnaire.

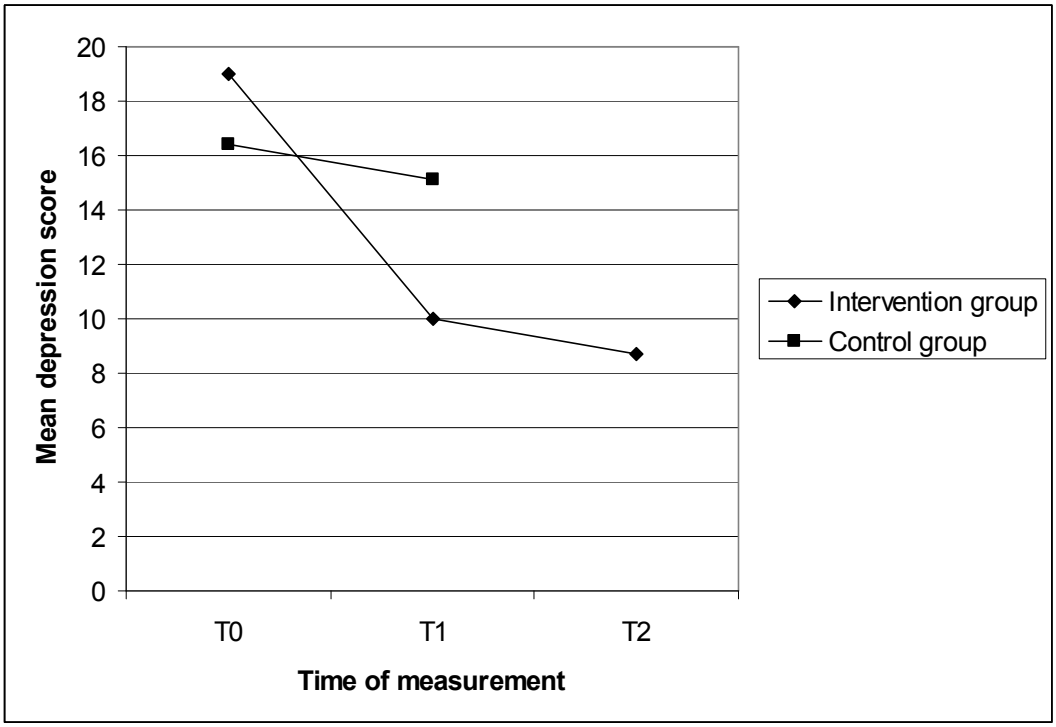

Figure 2: Mean depression score over time.

Note. Depression (Beck Depression Inventory, BDI-II) by group (intervention vs. control) and time of measurement (n = 36).

Table 3: Correlations of the SES (self-esteem), WHO-5 (wel-lbeing), LSIA (life satisfaction), integrative rem. (RQ) and obsessive rem. scores at pre- and post-treatment with the BDI residual gain score at post-treatment and follow-up in the intervention and control group.

Variable	BDI residual gain score at post-treatment (covariate: age)				BDI residual gain score at follow-up
	Intervention group		Control group		Intervention group
	Pre	Post	Pre	Post	Follow-up
Self-Esteem (SES) score	.44	.70**	-.10	-.38	-.10
Well-being (WHO-5) score	-.14	-.30	.02	-.45	-.57*
Life satisfaction (LSIA) score	.09	-.17	.29	-.07	-.05
Integrative Rem. (RQ) score	-.22	-.48*	.14	.10	-.42
Obsessive Rem. (RQ) score	-.55*	-.38	.24	.38	.02

Note. BDI-II = Beck Depression Inventory, SES = Rosenberg Self-Esteem Scale, WHO-5 = WHO-Five Well-being Index, LSIA = Life Satisfaction Index, RQ = Reminiscence Questionnaire; * $p < .05$. ** $p < .01$.

Discussion

The aim of this study was to investigate a structured and time-limited (six-week) life-review intervention in a randomized controlled trial (waiting list) with depressive older adults in a face-to-face setting with additional use of two depression modules of the e-mental health “Butler system” (Botella, et al., 2009). To our knowledge, this is the first study to investigate a life-review intervention in this combined setting for depression in older adults.

First, we examined whether our intervention led to a reduction in depressive symptoms. Our results showed that the depressive symptoms decreased significantly over time until the 3-month follow-up in the intervention group compared to the control group. Analysis revealed medium to large effect sizes. These findings are in line with previous studies reporting that life-review intervention is an effective intervention to reduce depressive symptoms in older populations (Bohlmeijer, et al., 2003; Pot, et al., 2010; Serrano, et al., 2004).

Furthermore, the drop-out rate in our sample was low. Only one individual in the intervention group discontinued participation after signing the informed consent but before starting treatment. Three participants in the control group dropped out before the post-assessment and before starting the treatment. This is in line with Bohlmeijer et al. (2003), who reported relatively low drop-out rates in their meta-analysis. Since the process of re-thinking one’s past life is a normal activity, one could speculate that life-review intervention was recognized as a rather naturalistic setting by the participants, who therefore continued treatment with rather high motivation.

Furthermore, we investigated whether our intervention led to an increase in well-being and a decrease in obsessive reminiscence among the

participants in the intervention group. Results indicate that this was not the case from pre- to post-treatment, but did occur from pre-treatment to follow-up. As mentioned above, none of the responders received psychotherapeutic treatment elsewhere during this time period, i.e. this result could be interpreted as a further intervention effect. Concurrently, the depression score decreased further from post-treatment to follow-up. This may indicate that the intervention caused further positive effects among the participants. In a meta-analysis, Bohlmeijer et al. (2007) focused on well-being in this context (including studies with only pre- and post- and follow-up measurements) and found an overall medium effect size. Wong & Watt (1991) focused on reminiscence styles in the context of successful aging and found that individuals showing higher obsessive reminiscence were not part of the successful agers group. One could speculate that after the end of treatment, the individuals in the current study probably continued to practice the strategies which they had developed during the therapeutic process, and were probably coping better with problems arising in their lives, a characteristic that is related to successful aging (Wong & Watt, 1991). As mentioned above, at the end of the final session, all participants received a printed version of their text and photographs of the Book of Life in order to further adopt the developed strategies.

We further found a significant negative correlation between well-being and the depression residual gain score at follow-up, indicating that a higher sense of well-being is related to greater symptom reduction. The residual gain score was calculated such that a negative sign indicated improvement, i.e. symptom reduction. Moreover, results showed that individuals with higher levels of obsessive reminiscence at baseline and integrative reminiscence at

post-treatment benefited more from the intervention. Our hypothesis that integrative reminiscence might increase during treatment failed to reach significance. This finding is comparable to Pot et al. (2010), who did not find any significant changes in reminiscence styles after a life-review intervention.

Furthermore, results did not show a significant change in life satisfaction. One could speculate that life satisfaction might be recognized as a more stable construct (Ryff, 1989), which would be more challenging to change during a short-term (six-session) therapeutic intervention. Analysis further indicated a significant but small interaction effect concerning self-esteem and an unexpected finding that individuals with higher levels of self-esteem at post-treatment benefit less from the intervention. It might be speculated that individuals showing higher levels of self-esteem believe or trust more in their behavior and strategies, and are therefore less willing to change their behavior or way of living.

The limitations of our study include a low sample size (N = 36) and a bias due to self-selection based on our recruitment advertising. 31% of the participants had previous experience of psychotherapy and indicated high interest and motivation. Further, we selected a rather homogeneous sample due to our strict exclusion criteria, e.g. comorbidity. It is well known that depression co-occurs with other disorders (Hautzinger, 2000). These facts may limit the generalizability of our results, and future research should focus more on comorbidity when investigating depression in elder populations.

A further limitation of our study was the inclusion of a waiting-list control group. Our results indicate that the intervention was an effective treatment to decrease depressive symptoms among depressive older adults. However, we cannot state that this intervention was as effective, or even

more effective, than treatment as usual (e.g. standard CBT). Investigating this intervention in a randomized controlled setting with a treatment-as-usual control group could be a valuable next step in researching life review in this combined setting.

Considering these limitations, it is nevertheless noteworthy that we found significant medium-to-high effect sizes in a rather low sample, indicating that a life-review intervention in this combined setting could be recommended for older adults aged 65 or over. To our knowledge, this is the first randomized controlled trial in this context, and therefore our study contributes to providing a better understanding of the effects of life review with computer supplements on depression among older adults, replicating previous findings on traditional face-to-face life-review interventions (Bohlmeijer, et al., 2003; Pot, et al., 2010; Serrano, et al., 2004).

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